THE EFFECTS OF EXPLICIT INSTRUCTION IN CONTEXTUAL APPLICATION OF PHONOLOGICAL AWARENESS ON THE READING SKILLS OF FIRST-GRADE STUDENTS

BY

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TABLE OF CONTENTS

page

ACKNOWLEDGMENTS iv

ABSTRACT vii

CHAPTERS

I INTRODUCTION TO THE PROBLEM 1

- Introduction 1
- Rationale for the Study 3
- Scope of the Study 4
- Definition of Terms 5
- Overview 6

II REVIEW OF RELATED LITERATURE 8

- Introduction 8
- Theoretical and Empirical Basis for Instruction in Phonological Awareness 8
- The Relationship Between Phonological Awareness and Reading Ability 13
- Measurement of Phonological Awareness 24
- The Relationship Between Reading, Spelling, and Phonological Awareness 30
- Effects of Instruction in Phonological Awareness on Development of Reading Skills 35
- Code-Emphasis vs. Meaning-Emphasis Approaches to Reading Instruction 49
- Connectionist Theory and Reading Instruction 51
- Implications for Research 58

III METHODS AND PROCEDURES 60

- Introduction 60
- Hypotheses 60
- Methods 62
- Research Instrumentation 67
- Experimental Design 74
- Instructional Procedures 74
- Treatment of the Data 80

IV RESULTS... 82

Introduction.. 82
Reliability of Measurement and Instructional Procedures... 83
Statistical Analysis of the Data.................... 84
Related Findings.................................... 92
Social Validation Measures.......................... 102
Summary... 104

V DISCUSSION... 107

Summary of the Hypotheses and Results............... 107
Theoretical Implications of the Findings............ 110
Limitations to the Present Study.................... 114
Suggestions for Future Research..................... 115
Summary... 116

APPENDICES

A PARENTAL INFORMED CONSENT DOCUMENT.................. 118

B SCREENING MEASURE OF INVENTED SPELLING.............. 121

C MEASURES OF PHONOLOGICAL AWARENESS.................. 124

D DECODABLE WORD AND NONWORD MEASURE.................. 133

E SCRIPT FOR PRELIMINARY INSTRUCTIONAL SESSIONS....... 140

F SCRIPT FOR REGULAR INSTRUCTIONAL SESSIONS........... 155

G PASSAGES AND TARGET SOUND LISTS..................... 167

H PROCEDURAL RELIABILITY OBSERVATION RECORD........... 184

REFERENCES.. 186

BIOGRAPHICAL SKETCH................................... 199

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By

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Connectionist theory supports contextual application of skills during instruction as a means of strengthening associations. This study is an examination of the role of explicit instruction in the contextual application of phonological awareness skills. The effects of contextual application instruction on decoding, reading fluency, reading comprehension, and the development of phonological awareness skills were tested.

A pretest-posttest control group design was employed. First-grade students (N=43) in two groups received 18 sessions of phonological awareness instruction over an 8-week period. Students in the experimental group received instruction in phonological awareness, passage reading practice, and explicit instruction in the contextual application of phonological awareness skills. Students in the comparison group received instruction in phonological awareness and passage reading practice but received no instruction in the contextual application of phonological awareness skills.

A series of analyses of covariance (ANCOVAs) revealed no significant differences between the experimental and comparison groups on measures of phonological awareness, decoding, passage reading fluency, or reading comprehension. Subsequently, each group was divided into two levels based on pretest fluency scores. Comparison of the gain scores of those subjects who demonstrated nonfluent reading on the pretest revealed significant differences between the experimental and comparison groups. Those subjects with very low scores on the pretest of reading fluency who received phonological awareness instruction with a contextual application component demonstrated significantly higher gain scores on measures of reading comprehension and total phonological awareness than comparable subjects in the comparison group.

Several implications for beginning reading instruction and research emerge from these findings. Teachers should understand that instruction that includes practice of reading skills in a meaningful context may be beneficial to their students, especially those students with very weak skills.

Researchers should consider the implications of connectionist theory in beginning reading research. The strengthening of associations between phonological awareness instruction and the context in which the skills are applied may be an important area of research for improving beginning reading instruction.

CHAPTER I
INTRODUCTION TO THE PROBLEM

Introduction

Reading is a foundation skill for school learning and life learning. The ability to read is critical for success in modern society. Consequently, learning to read is one of the most important accomplishments in a child's school career (Anderson, Hiebert, Scott, & Wilkinson, 1985). Illiterate adults account for more than 75 percent of unemployed Americans. In addition, 85 percent of adjudicated juveniles, 60 percent of incarcerated individuals, and nearly 40 percent of minority youth are functionally illiterate (Lerner, 1988). The link between the acquisition of literacy and success in life cannot be overemphasized.

Many children experience difficulties in the early stages of learning to read that become barriers to later reading and learning. Researchers have indicated that the quality of beginning reading instruction and early reading achievement can significantly influence achievement in high school and beyond (Chall, 1983). Failure to achieve at grade level during early reading instruction reduces the likelihood of ever achieving at grade level (Carter, 1984). A primary focus of recent research in education, therefore, has been the prevention of early reading problems through instruction (Adams, 1990).

Research about phonological awareness instruction as a method of preventing reading problems has gained considerable attention in the past decade. Phonological awareness has been shown to be a reliable predictor of reading achievement, and the early development of phonological awareness has been shown to facilitate beginning reading acquisition. That is, children who have weak phonological processing skills typically become poor readers while those with strong phonological skills become good readers (Alegria & Morais, 1991; Blachman, 1984, 1989, 1991; Brady & Fowler, 1988; Bryen & Gerber, 1987; Catts, 1989, 1991; Ehri, 1979; Felton & Brown, 1989; Jorm & Share, 1983; Kamhi, 1989; Liberman & Shankweiler, 1991; Mann, 1986, 1991a, 1991b; Perfetti, 1991; Perfetti, Beck, Bell, & Hughes, 1987; Snowling, Goulandris, Bowlby, & Howell, 1985; Stanovich, 1992; Treiman & Baron, 1981; Tunmer, 1991).

Fortunately, children who are poor readers can develop phonological awareness with appropriate instruction (Adams, 1990; Blachman, 1991; Liberman & Shankweiler, 1991; Stanovich, 1987). Early intervention in reading through training in phonological awareness has been shown to be useful in preventing the development of reading problems (Adams, 1990; Griffith & Olson, 1992; Mann & Liberman, 1984; Pratt & Brady, 1988). Few researchers, however, have attempted to determine which features of phonological awareness training are necessary to promote early reading achievement.

Rationale for the Study

While much of the research on phonological awareness has focused on its role in reading acquisition, recent studies have compared the effectiveness of various training methods (Ball & Blachman, 1991; Haskell, Foorman, and Swank, 1992; Lundberg, Frost, & Petersen, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993; Torgesen, Morgan, & Davis, 1992). The next logical step in this area of research is to combine theory and research on learning and effective teaching with what is known about the development of phonological awareness.

The purpose of this study was to determine the effects of instruction in phonological awareness that emphasizes the contextual application of phonological knowledge. Specifically, the effect of context-based training on the phonological awareness, word and nonword reading, reading fluency, and reading comprehension of beginning readers was examined. The theoretical notion of connectionism (Adams, 1990; Bereiter, 1991; Bechtel, 1991; Rumelhart & McClelland, 1986; Shankweiler, 1989) was applied within the training component. Connectionist theory considers learning to be a product of strengthened associations. These associations are formed and strengthened through instruction within an appropriate context. Training that includes explicit instruction in the contextual application of phonological skills is compared with training that lacks contextual application. The role of context, as espoused by connectionists, in developing and applying phonological skills is tested by this comparison.

Scope of the Study

This study was conducted within a limited scope. The delimitations and limitations of this research are described in the following sections.

Delimitations

The study was delimited by geographical location to Gainesville, Florida, a medium-sized city located in the north central part of the state. The subjects were 43 first-grade students in three schools in Alachua County. Subjects were selected for participation in the study based on low scores on a group screening measure of phonological awareness. The schools were selected based on the socioeconomic makeup of the general school population. Subjects were pretested on measures of verbal ability, phonological awareness, word and nonword reading, reading fluency, and reading comprehension. Groups were matched as closely as possible on the pretest measures. Subject selection did not include consideration for gender or ethnicity.

Limitations

This study was conducted with first grade subjects during the second half of the school year. The previous informal reading experiences and formal reading instruction of the subjects may limit this investigation. The nature of the training, conducted in small groups outside of the regular classroom, may further limit the study. Finally, the results of this study may not be generalized to older or younger students or to students with strong phonological skills without systematic replications with these populations.

Definition of Terms

An understanding of the constructs, variables, and procedures discussed in this study requires an understanding of the terminology. The terms defined in this section are critical to the implementation and interpretation of this study.

Blending is the act of combining word parts, including words, syllables, intrasyllabic units, and phonemes to construct a word.

Connectionism is a theoretical approach to studying and understanding cognition. Connectionist theory represents learning as the creation or strengthening of associations. Within the connectionist framework, learning occurs with the activation of these associations (Adams, 1990).

Contextual application is the practice of a skill in a condition or situation similar or equivalent to that in which it is to be used.

Fluency is the rate and accuracy in oral reading. The fluency measure for this study scored the number of words in a passage read correctly in one minute.

Onset and rime are intrasyllabic units. In other words, a syllable may be divided into its onset, all phonemes before the vowel, and its rime, the vowel and all phonemes following the vowel.

Phoneme refers to the smallest sound unit of language. A phoneme is typically represented graphically by a single letter (e.g., b = /b/), although many letter combinations represent a single phoneme (e.g., e + a = /e/).

Phonological awareness is the sensitivity to, or the explicit awareness of, the sound structure of language (Torgesen & Bryant, 1994). Phonological awareness includes the ability to analyze and manipulate the phonological components of words by detecting, segmenting, blending, deleting, or substituting sounds (Ehri, 1989; Torgesen & Bryant, 1994).

Segmentation is the breaking down of words into their component parts, usually phonemes.

Overview

An investigation of the effects of phonological awareness instruction that emphasizes the contextual application of phonological knowledge is the focus of this study. Chapter II provides a review and analysis of relevant professional literature in the areas of beginning reading, phonological awareness and connectionism. The implications of previous research for beginning reading instruction are discussed, as well. Chapter III supplies a description of the methods and procedures used in this study. The results obtained from the training are discussed in Chapter IV. Finally, Chapter V comprises a discussion of the results as related to previous research, implications for teacher education, and recommendations for future research.

CHAPTER II
REVIEW OF RELATED LITERATURE

Introduction

Chapter II includes a summary and analysis of the professional literature on the relationship of phonological awareness to reading ability, the development of phonological awareness in good and poor readers, and instruction in phonological awareness. The literature on the role of context in reading instruction is also presented.

The chapter is divided into several sections. The theoretical and empirical basis for including instruction in phonological awareness as an integral part of beginning reading instruction is presented in the first section. The subsequent sections provide a summary and analysis of relevant studies about phonological awareness, a discussion of connectionist theory, and an examination of the role of context in phonological awareness instruction. The chapter concludes with a summary of the research findings, including the implications of previous research for this study.

Theoretical and Empirical Basis for Instruction in Phonological Awareness

The ability to read is essential for most tasks in school and for many tasks associated with a productive life. In *Becoming a Nation of Readers*, Anderson, Hiebert, Scott, and Wilkinson (1985) aver that "reading is a basic life skill. It is a cornerstone for a child's success in school and, indeed, throughout life. Without the ability to read well, opportunities for personal fulfillment and job success inevitably will be lost" (p. 1). With such significance assigned to reading in our society, educators must employ the most effective methods available during beginning reading instruction. Unfortunately, as many as 25% of all school-age children continue to experience tremendous difficulty learning to read through the methods typically employed in schools (Liberman & Liberman, 1990).

Poor performance in early reading can have lasting effects. Stanovich (1986b) described a phenomenon that he calls Matthew effects in reading. Stanovich explained that children who experience early success in reading are likely to read more and, subsequently, become even better readers. Children who experience difficulty during early reading, however, spend less time reading and, therefore, achieve less progress. The possibility that early reading instruction in phonological awareness could alleviate some of the early reading failures that Stanovich described warrants further attention.

Phonological awareness is defined as the sensitivity to, or the explicit awareness of, the phonological structure of language (Torgesen & Bryant, 1994). Phonological awareness includes the ability to analyze and manipulate the phonological components of words by detecting, segmenting, blending, deleting, or substituting sounds (Ehri, 1989).

Stanovich (1987) calls phonological awareness research a "scientific success story" because researchers have been able to establish clear links between a theoretical process and practical implementation. To provide a foundation for this study, the following sections outline the core of the phonological awareness literature.

Adams (1990) presented a theoretical model of the reading process adapted from earlier connectionist models by Rumelhart and McClelland (1986), Rumelhart (1989), and Seidenberg and McClelland (1989). Adams's model represents the reading process as a collective effort of four processors: orthographic, meaning, context, and phonological. Each processor performs a portion of the reading task, but skilled reading requires the orchestration of simultaneous effort from each processor.

The orthographic processor accepts information directly from print. The graphic representation of a word activates the orthographic processor which recognizes the word from previous associations and transmits the information to the meaning processor for interpretation. If, however, the orthographic information is insufficient for the orthographic processor to transmit or for the meaning processor to interpret, additional information must be generated by the phonological processor. For example, presentation of an unfamiliar word would require the activation of the phonological processor because no previous associations have been established with the orthographic features of the word.

A skillful reader's phonological processor accepts information from speech and interacts with the orthographic processor to send sufficient information to the meaning processor to allow for interpretation. Phonological information is essential for decoding and reading fluency. In addition to sounding out words, phonological processing includes the translation of sounds into words and interpretation of those sounds into meaningful units.

According to Adams's (1990) model, phonological processing abilities are integral to skilled reading. The most basic ingredient to phonological processing is phonological awareness. A reader who lacks phonological awareness is likely to experience difficulty with reading tasks in which orthographic information alone is insufficient. A reader with weak phonological awareness is also less likely to benefit from phonics instruction, a common method to develop decoding skills. The activation of phonological awareness is, therefore, an essential part of instruction in beginning reading.

Yopp and Singer (1985) advanced an Interactive Reading Instructional Model as a method of encouraging the activation of linguistic awareness in students. In the model, the demands of the task and the reader resources interact to initiate a goal response from the student. Each of the components of the interaction, however, is under the influence of the instructor. In other words, the instructor can influence the interaction by creating tasks that promote linguistic awareness and the application of skills. As students become older, instructors tend to shift more of the linguistic and cognitive demands on the student. Yopp and Singer postulated that beginning readers can perform significantly better when provided with metalinguistic assistance or guidance in reading tasks. Metalinguistic assistance most often takes the form of prompts during decoding. For example, if a student begins to struggle with a word, the teacher may ask the student, "What sound does the first letter make? The second? Can you put the sounds together?" Without providing answers, the teacher reminds the student of the cognitive and linguistic strategies used to decode the word. If students are to be able to respond to the metalinguistic demands of reading (e.g., phoneme segmentation) early reading teachers must assume an active role in the interaction and accept these demands during initial instruction. Therefore, the instructor's role in activating phonological awareness is crucial and must be explicit.

The associations developed through an interactive model such as Yopp and Singer's (1985) may be viewed from the perspective of connectionist theory. According to Adams (1990), connectionist theory represents learning as the creation or strengthening of associations. Within the connectionist framework, learning occurs with the activation of the associations between familiar and unfamiliar concepts. These activations may be evoked directly by an outside stimulus, indirectly by the similarity of experiences, or internally through reflection. Connectionist theory provides a framework that supports the use of context in instruction to facilitate learning and generalization. A more thorough discussion of connectionist theory and its role in beginning reading instruction is presented later in this chapter.

This chapter includes descriptions of studies that examine the relationship between phonological awareness and reading ability, including causality and predictive value. Included in this review are studies that examine the nature of phonological processing, the development of phonological awareness in normal and poor readers, and the relationship of phonological awareness to spelling and related tasks. Sections of this chapter also include a review of studies relating to training in phonological awareness and an examination of the role of context in reading instruction.

The Relationship Between
Phonological Awareness and Reading Ability

Numerous studies have examined the relationship between phonological awareness and reading ability (Cornwall, 1992; Lenchner, Gerber, & Routh, 1990; Liberman & Shankweiler, 1985; Pratt & Brady, 1988; Snyder & Downey, 1991; Stanovich, 1986a; Tornéus, 1984; Tunmer & Nesdale, 1985; Vellutino & Scanlon, 1987; Wagner & Torgesen, 1987; Williams, 1984). Phonological awareness tasks have been shown to be excellent predictors of reading ability or reading disability. In other words, children who perform well on tasks of phonological awareness typically are or will become good readers while children who perform poorly on phonological awareness tasks are or will become poor readers (Alegria & Morais, 1991; Blachman, 1984, 1989, 1991; Brady & Fowler, 1988; Bryen & Gerber, 1987; Catts, 1989, 1991; Ehri, 1979; Felton & Brown, 1989; Jorm & Share, 1983; Kamhi, 1989; Liberman & Shankweiler, 1991; Mann, 1986, 1991a, 1991b; Perfetti, 1991; Perfetti, Beck, Bell, & Hughes, 1987;Snowling, Goulandris, Bowlby, & Howell, 1985; Stanovich, 1992; Treiman & Baron, 1981; Tunmer, 1991).

The question of causality in the relationship between reading ability and phonological awareness is inevitable. Most researchers agree that the relationship can be considered reciprocal (Ehri, 1979; Perfetti, Beck, Bell, & Hughes, 1987; Stanovich, 1986a; Tunmer, 1991). Phonological awareness may be both an antecedent to reading acquisition and a result of reading knowledge (Catts, 1989). That is, phonological awareness precedes the development of decoding skills but increases as decoding skills improve.

Role of Phonological Awareness in Reading

Adams (1990) noted that phonological translations of words remain in memory longer than their visual images and can be recalled without visual cues. Because readers are able to activate and reactivate the phonological processor at will by speaking, subvocalizing, or generating speech images, phonological information is more accessible over time than visual information. Phonological processing provides necessary support to the other processors by acting as an alphabetic back-up system, which is critical for maintaining speed and accuracy during reading, and by expanding accessible memory for individual words, which is essential for fluid comprehension.

Thorough knowledge of letters, spelling patterns, and words is essential to skilled reading and its acquisition. The orthographic code is the avenue through which print is translated into meaning. Griffith and Olson (1992) emphasized that phonological awareness is essential for young readers to grasp the English orthographic code. They explain that, to be able to learn to read and spell words, children must have an understanding of the phonological translations made during reading, or how spoken language maps onto written language. The utility of orthographic knowledge without phonological awareness is, therefore, limited.

Olson, Kliegl, Davidson, and Foltz (1985) also considered the role of phonological awareness in the reading process. Their theoretical model of the reading process illustrates the relationship between the alternate pathways to meaning in reading. Like Adams (1990), Olson et al. suggested that readers may identify words either directly through an orthographic path or through a combined orthographic/phonological path. They used these pathways as an explanation of group and individual differences in reading disabilities. Within each path, several factors may cause deficits in reading, including phonological processing, phonetic memory, and orthographic processing. Following a review of several experiments, Olson et al. concluded that phonological processing deficits present a significantly greater contribution to reading disabilities than orthographic processing problems. They suggest that early training in phonological awareness for children who are considered to be at risk for reading failure may help reduce the incidence of reading disabilities.

Torgesen and Morgan (1990) evaluated the role of phonological analysis and synthesis abilities in learning to read. They suggested that phonological synthesis (i.e., blending phonological components of words) may be more critical than phonological analysis (i.e., segmenting word components) to the development of beginning reading skills. They speculated that this may be due to the similarity between phonological synthesis and decoding during reading. They also suggested that phonological awareness may be a relatively inert ability in children until the application in decoding is made explicit.

Shankweiler (1989) described the relationship between phonological deficits and difficulties with decoding. He explained that poor readers cannot successfully analyze orthographic information through phonological channels to access the meaning in text. A lack of phonological awareness can prevent a reader from decoding, thus limiting access to meaning. According to Shankweiler, phonological awareness is, therefore, linked to reading comprehension through its effect on decoding ability. Shankweiler advocated the use of contextual supports in decoding instruction to facilitate the development of reading comprehension skills.

Liberman and Shankweiler (1985) also stressed the importance of the relationship between phonological processing and word reading, naming, and sentence comprehension. Problems in comprehension are often exacerbated by difficulties in phonological processing. Liberman and Shankweiler reported that weak phonological awareness is a primary cause of problems in learning to read and write.

Catts (1986) explained that children with reading disabilities also make significantly more speech production errors. Catts attributes these errors to deficits in phonological processing. Children who lack a sensitivity to the sound structure of language make phonological errors during speech as well as during reading. Inaccurate practice during speech may facilitate the formation of inappropriate sound associations causing both speech and reading problems.

Development of Phonological Awareness

Although children come from a wide variety of backgrounds, initial reading instruction in schools is essentially the same for all children. Adams (1990) emphasized the importance of early reading and language experiences to the development of phonological awareness and reading skill. Adams evinced that many children come to school at a significant disadvantage due to severely limited early experiences with print. The development of phonological awareness requires experience with language activities, many of them informal and game-like, that promote linguistic awareness. Children who have been provided with a wide range of language and reading experiences may independently develop some level of phonological awareness.

Maclean, Bryant, and Bradley (1987) tested the theory that children learn to analyze the component sounds in words through common linguistic routines, particularly through nursery rhymes. The awareness that two words rhyme requires some awareness of the component sounds. Maclean et al. conducted a longitudinal study in which 3-year-old children were assessed to determine their knowledge of nursery rhymes and their phonological skills. A strong direct correlation was detected and remained significant when differences in IQ and socioeconomic status were controlled.

Hurford, Darrow, Edwards, Howerton, Mote, Schauf, and Coffey (1993) examined the phonemic processing abilities in children during the first grade. The phonological awareness and reading ability of 209 students was measured during the first quarter and again during the last quarter of first grade. Subjects were identified as reading disabled, nondisabled, or garden-variety poor readers. The results indicated that the children with reading disabilities and the garden-variety poor readers made improvements in reading ability and phonological awareness in the first grade, but their scores were still significantly below the scores of the nondisabled readers. Notably, the gap between the nondisabled readers and the other two groups widened during the year. This finding confirms the assertion that successful engagement in reading acts to increase the reading skills and phonological awareness of good readers, while poor readers become progressively more deficient in these skills as a result of their lack of success (Stanovich, 1986b).

Yopp (1992) suggested that teachers can take an active role in developing their students' phonological awareness. She promotes the use of activities that "facilitate children's ability to perceive that their speech is made up of a series of sounds" (p.699). The emphasis, according to Yopp, should be placed on activities that focus on the sounds in spoken language. Specifically, she suggested the use of activities such as sound matching, sound blending, sound addition, and sound segmentation. She also suggested that activities should be group-based and should encourage children's curiosity about language. Yopp emphasized the relationship between success in early reading and the development of phonological awareness.

Because phonological awareness is derived from speech information, some children develop a high degree of phonological awareness without any formal instruction (Kamhi & Catts, 1989). Such children, however, have typically had a variety of experiences with nonreading language play (Adams, 1990). Because such variations in phonological awareness may be found within a limited population of children, it is important to consider the different levels of phonological awareness and the implications of these levels for reading instruction.

Levels of Phonological Awareness

As previously stated, phonological awareness can be described as a sensitivity to the phonological components of language. The levels of phonological awareness development are associated with the different phonological components of language, including words, syllables, onsets and rimes, and phonemes (Blachman, 1991).

Word. The awareness that the speech flow is a compilation of individual words is typically achieved at a very young age. The linguistic play of young children, including nonsense words and rhyming, provides evidence of this early level of phonological awareness (Bradley, 1988). When a child utters a single word that he has only heard in combination with other words, he is demonstrating the word level of phonological awareness.

Syllable. Syllables are the most easily distinguishable units within words. Most children acquire the ability to segment words into syllables with minimal instruction (Lundberg, 1988; Liberman, Shankweiler, & Liberman, 1989). Activities such as clapping, tapping, and marching are often used to develop syllable awareness. This level of phonological awareness is useful for initial instruction in detection, segmentation, blending, and manipulation of phonological components of language. The ability to detect, segment, and count syllables is more important than the ability to manipulate and transpose them (Adams, 1990).

Onset and rime. Adams (1990) discusses an intermediate and instructionally useful level of analysis between the syllable and the phoneme. The onset is the part of the syllable that precedes the vowel (e.g., the *c* in *cat*, the *br* in *brown*). The rime is the rest of the syllable (e.g., the *og* in *dog*, the *ack* in *black*). All syllables must have a rime, but not all syllables have an onset (e.g., *and*, *out*, *or*).

Treiman (1985) found that children make more errors with consonants at the end of words or with consonant blends than with initial or medial consonants. This finding suggests that their natural segmentation of words is neither at the syllable nor at the phoneme level. Most children spell rimes more accurately than individual vowel sounds. This indicates that their orthographic processing primarily involves onset and rime segmentation (Adams, 1990).

Goswami and Mead (1992) conducted a study of onset-rime awareness in 44 6- and 7-year-olds to determine the relationship between onset-rime awareness and the use of analogies at the beginnings and ends of words. They demonstrated that end analogies are easier and occur earlier in reading development. Because rimes remain intact in end analogies, Goswami and Mead speculated that they are easier to manipulate than beginning analogies, in which the rime must be segmented.

Hurford, Gilliland, and Ginavan (1992) examined an intrasyllabic phonemic discrimination deficit in children with reading disabilities. In their study of 78 second, third, and fourth grade children with reading disabilities, subjects were trained to discriminate between syllables (vowels, syllables that began with the plosive consonants /d/ and /g/, and syllables that began with the liquid consonants /r/ and /l/). The children with reading disabilities performed significantly worse on the task than nondisabled readers. All subjects performed better on the vowel discrimination. Hurford, Gilliland, and Ginavan concluded that vowels are easier to discriminate than consonants. They also speculated that the consonant-to-vowel transitions present in the syllables beginning with consonants may have made the discrimination between those syllables a more difficult task.

Treiman (1985, 1991, 1992) promoted the use of instruction at the onset and rime, or intrasyllabic, level. Because tasks that require onset and rime analysis require the segmentation of syllables, they are more sophisticated than syllable-level tasks. Yet these same tasks are easier than phoneme-level tasks because they do not require discrimination between individual phonemes. Onset-rime tasks could, therefore, be considered an intermediate step in the development of phonological awareness. The difficulty that many children experience when progressing from syllabic analysis to phonemic analysis may arise because the intermediate step, the intrasyllabic unit, is omitted. Providing experience working with onsets and rimes may alleviate this difficulty.

Phoneme. Phonemic awareness is different from phonological awareness in that it applies specifically to phoneme-grapheme relationships. Phonemic awareness skills include the ability to detect, segment, and blend phonemes and to manipulate their position in words (Adams, 1990; Lenchner et al., 1990). Phonemes are impossible to segment in a pure sense. In the speech flow, phonemes are formed and blended in such a way that one phoneme's production is influenced by the surrounding phonemes (e.g., the /k/ is formed differently in the words *cat* and *cot* due to the influence of the vowel that follows it). Because phonemic analysis requires the reader to detect, segment, and manipulate individual phonemes, it is a much more sophisticated task and, consequently, a much more difficult task than either syllabic or intrasyllabic analysis (Treiman, 1991, 1992).

Although reading achievement gains occur following training in phonemic awareness, phonemic awareness also improves with reading instruction (Pratt & Brady, 1988). In addition, Byrne and Fielding-Barnsley (1991a) report the generalization of phonemic awareness instruction demonstrated by improvements in both trained and untrained phonemes.

Measurement of Phonological Awareness

Measuring a child's level of phonological awareness is a fundamental step both in research and in intervention. Gaining an accurate representation of a child's beginning level of phonological awareness allows the researcher or teacher to gauge the effectiveness of interventions. A variety of formal and informal measures have been employed in studies of phonological awareness. Yopp (1988) investigated the reliability and validity of the most commonly used measures of phonological awareness. She determined that the reliability and validity of measurement tasks was the greatest when a combination of measures was employed. The most commonly used methods of measurement are presented in this section.

Rhyming, oddity, segmentation, blending tasks. The most obvious method of measuring a child's phonological awareness is to observe the child's ability to perform tasks that require the use of phonological awareness. Researchers have employed tasks involving a variety of phonological skills. For example, some studies have examined children's ability to detect and produce rhymes (Maclean, Bryant, & Bradley, 1987; O'Connor, Jenkins, Leicester, & Slocum, 1993).

O'Connor et al. (1993) investigated the use of phonemic oddity detection as a measurement tool. Oddity detection is the ability to detect the word or words in a series that has a different initial, medial, or final phoneme (e.g., "Which word does not begin with the same sound as cat: card, fat, or cot?")

The ability to segment the phonemes in words (e.g., cat = /k/ + /a/ + /t/) has been the focus of numerous investigations (Burns & Richgels, 1989; Byrne & Fielding-Barnsley, 1990; Foorman, Francis, Novy, & Liberman, 1991; Mann & Liberman, 1984; O'Connor et al., 1993; Tornéus, 1984). Deletion tasks require the segmentation and omission of a phoneme or syllable (e.g., "Say cat without the /k/ sound."). Deletion tasks are also used as a measure of phonological awareness (Perfetti et al., 1987; Pratt & Brady, 1988). Phonemic blending (i.e., combining phonemes to form onsets, rimes, syllables, or words) is yet another common measure of phonological awareness (O'Connor et al., 1993; Perfetti et al., 1987; Tornéus, 1984). A combination of these tasks appears to be the most widely used and accepted method of measuring phonological awareness.

Lindamood Auditory Conceptualization Test. The LAC Test provides a formal method for measuring phonological awareness. Calfee, Lindamood, and Lindamood (1973) studied the effectiveness and the predictive validity (for reading and spelling performance) of the LAC with students in kindergarten through twelfth grade. Significant correlations (from .8 to .9) were found between LAC performance and reading and spelling scores on the Wide Range Achievement Test (WRAT). More than 40% of the variance on the WRAT is accounted for by total LAC scores. Calfee et al. concluded that the LAC is an effective measure of phonological awareness and that it is highly predictive of word reading and spelling performance through high school. Researchers frequently use the LAC as measurement tool in studies of phonological awareness (Kennedy & Backman, 1993; Pratt & Brady, 1988).

Group testing. Although the rhyming, oddity, segmenting, and blending measures described are typically administered individually, group testing may also be feasible. Torgesen, Wagner, Bryant, and Pearson (1992) evaluated an experimental version of the Screening Test of Phonological Awareness (STOPA), a group-administered kindergarten screening instrument. They compared the findings of the group administered test with the results of individually administered test of phonological awareness. Torgesen et al. found that there were no significant differences in internal consistency between the two measures. The level of performance on the STOPA and the individually administered test was similar. The reliability on a 30-item version of the STOPA was calculated at .93. They concluded that screening for phonological awareness using a group administered test is both feasible and practical. They recommended a test that comprises at least 30 items of two different types (i.e., identifying both *same* and *different* phonemes). Tests with these item types are both simple enough to be administered in a group setting and sophisticated enough to detect individual differences in phonological awareness.

Invented spellings. The ability to invent spellings exhibits some level of phonological awareness. Because the sophistication of a child's invented spelling demonstrates the child's amount of phonemic knowledge, invented spelling can be useful tool for the measurement of phonological awareness (Bradley & Bryant, 1985; Ehri, 1989, 1991; Gough, Juel, & Griffith, 1992; Huxford, Terrell, & Bradley, 1991; Lundberg, Olofsson, & Wall, 1980; Mann, Tobin, & Wilson, 1987). Given the nature of spelling tests, measures of invented spelling can be administered either individually or in group testing situations.

Mann, Tobin, and Wilson (1987) studied the use of invented spellings of kindergarten children as a measure of phonological awareness and as a predictor of reading ability. In the first of two experiments, Mann et al. compared the performance of 29 kindergarten subjects on a test of invented spelling (scored for phonological accuracy) and on the Word Identification and Word Attack Subtests of the Woodcock Reading Mastery Tests (Woodcock, 1973) for the same subjects in first grade. Scores on the invented spelling and reading tests were significantly correlated. Mann et al. concluded from this experiment that invented spelling performance in kindergarten may be used to predict first grade reading ability. Children who produce a higher proportion of phonologically accurate preconventional spellings (e.g., *bot* for *boat*, *lade* for *lady*) tend to become better readers in the first grade.

In their second experiment, Mann, Tobin, and Wilson (1987) explored the linguistic and nonlinguistic factors that may be associated with individual differences in invented spelling. The performance of 22 kindergartners on tasks in invented spelling, speech classification, visual classification, and nonlinguistic graphomotor abilities was measured and comparisons were analyzed. Mann et al. found a significant correlation between the phonological accuracy of invented spellings and both the number of phoneme classifications made on the speech classification tasks and the comprehension of spoken sentences. The phonological accuracy of invented spellings did not appear, however, to be related to the performance on the visual classification tasks or to the nonlinguistic graphomotor tasks.

In a longitudinal study, Mann and Liberman (1984) examined the relationship between phonological awareness and verbal short-term memory. Subjects were 62 children who were tested in kindergarten on measures of phonological awareness, verbal short-term memory, and nonverbal short-term memory. The measures used included a syllable-counting test, a word-string memory test, and a block test. Comparisons were made among the performances on the three tests and the level of reading ability (good, average, or poor) in first grade. Results indicated that performance on the word-string tests was significantly correlated with first-grade reading ability [r(58) = .61, $p < .001$]. Furthermore, of the children classified as good readers in first grade, 85% had performed well on the syllable counting task in kindergarten. Conversely, only 17% of the children classified as poor readers in first grade had performed well on the syllable counting task in kindergarten. Mann and Liberman concluded that inferior performance on kindergarten tests of phonological awareness and verbal short-term memory may presage future reading problems in the first grade.

Phonological coding. Using phonological awareness skills in reading requires memory of phonological information. Torgesen, Wagner, Simmons, and Laughon (1990) described methods used for the assessment of phonological coding (i.e., translating sensory input into a representational form that can be readily stored in memory). They also proposed alternative measures. Memory span has been the most frequently used task to assess phonological coding. Torgesen et al. studied the use of auditory and visual digit spans, and the use of rapid naming of digits and letters in isolated trials and in series. In the isolated naming trials, stimuli were presented one letter or digit at a time on a computer screen. Serial naming tasks required children to name a series of digits or letters typed on paper. The only tasks that were significantly correlated with word identification skill were those requiring serial naming of digits or letters. Torgesen et al. concluded that a tool that combines the measurement of memory span with assessment of naming rate may be a more sensitive measure of coding problems than a measure of only memory span.

The Relationship Between Reading, Spelling, and Phonological Awareness

Pratt and Brady (1988) found a strong relationship between phonological awareness and reading ability for children and adults. Phonological awareness is also essential for efficient decoding (Blachman, 1991; Foorman et al., 1991; Tunmer & Nesdale, 1985) and spelling (Ball & Blachman, 1991; Ehri, 1979). To understand fully the relationship between reading, spelling, and phonological awareness, however, it is necessary to examine several essential components of the relationship. These include (a) the issue of causality, (b) the task requirements of reading and spelling, and (c) the effects of training in phonological awareness on the development of increased phonological awareness and on later reading and spelling performance.

Causality. Tornéus (1984) questioned the direction of causality between phonological awareness and reading ability, and determined that metaphonological abilities have a causal influence on early reading and spelling but found no support for the reverse causal influence. She concluded that learning to read and spell may be easier for some children if training in phonological awareness is included in their early reading curricula or in prereading programs.

Subsequent research did not fully support Tornéus's (1984) conclusion that the causal relationship between phonological awareness and reading ability is unidirectional. A bi-directional relationship appears more likely (Ehri, 1979; Catts, 1989). For example, Perfetti et al. (1987) aver that phonemic knowledge and learning to read are reciprocal.

In a longitudinal study of 82 children in the first grade, Perfetti et al. (1987) examined the relationship between phonemic knowledge and learning to read. The experimental groups consisted of one group instructed using a systematic code-emphasis program and two groups instructed using a widely used commercial basal series. Children were tested at four points during the school year on tasks of phoneme blending, deletion (e.g., "say cat . . . now say cat without the /t/"), and tapping (i.e., indicating the number of phonemes present by tapping a pencil). Performance of each of the groups on these tasks was compared with end-of-year reading performance. Perfetti et al. determined that tasks involving both analysis and synthesis of phonemes were reciprocally related to reading gains. In particular, the deletion task uses phonemic knowledge that is truly reciprocal with reading, that is, gains in reading ability enable gains in deletion which enable subsequent gains in reading ability.

Pratt and Brady (1988) examined the phonological awareness of older children and adults who have had difficulty learning to read. Despite several years of formal reading instruction, the subjects had experienced difficulty in reading. Pratt and Brady determined that differences in phonological awareness accounted for nearly 40% of the variance between good and poor readers.

Task requirements of reading and spelling. Reading and spelling both require knowledge of letter-sound correspondences. In addition, there is considerable evidence that phonological awareness facilitates both tasks (Bradley & Bryant, 1985; Burns & Richgels, 1989; Ehri, Wilce, & Taylor, 1987; Foorman et al., 1991; Liberman & Shankweiler, 1985; Lundberg, Olofsson, & Wall, 1980; Uhry & Shepherd, 1993).

Byrne (1991) stated that acquisition of the alphabetic principle is a prerequisite to skilled reading. He conducted a study to determine the role of phonological awareness in the acquisition of the alphabetic principle. Byrne tested preschool children on measures of alphabet knowledge and selected those who had minimal previous knowledge. Byrne trained 12 of these subjects in phonemic segmentation, segment identity, and phoneme identity. Most of the subjects were able to complete the tasks on the training items but were unsuccessful on measures of transfer in phonemic segmentation and segment identity. The subjects who were successful on the segmenting tasks were, however, able to complete the transfer tasks in phoneme identity. He concluded that phonological awareness is essential, but not sufficient, for the acquisition of the alphabetic principle. Byrne contends that phonological awareness training should be accompanied by phoneme identity training.

Cataldo and Ellis (1988) examined the interactions in the development of reading ability, spelling ability, and phonological awareness. Forty 4- and 5-year old subjects were assigned to four groups matched for IQ, reading ability, spelling ability, phonological awareness, letter-sound knowledge, short-term memory, and rhyme generation. All four groups worked with the same words during the training. Two groups received training in phonemic segmentation, the third group practiced reading the words using a look-say approach, while the fourth group practiced categorizing the words semantically. Tests of reading, spelling, and phonological awareness were readministered at the end of the children's first and second years in school. This sequence of assessment allowed Cataldo and Ellis the opportunity to examine the developmental relationships between reading, spelling, and phonological awareness. They determined, through an exploratory LISREL analysis, that explicit phonological awareness, developed through instruction in phonemic segmentation, becomes the most important influence in the ability to read and spell real words and nonsense words. They also found that experience in spelling promotes the use of phonological strategies in reading. They determined that development of reading ability, spelling ability, and phonological awareness is an interactive developmental pattern.

Burns and Richgels (1989) examined the relationship between phonological awareness, invented spelling, and reading. The subjects were 32 4-year-olds with above-average IQ scores. The subjects were classified as nonspellers or inventive spellers based on their performance on a test of invented spelling. Tests of alphabet knowledge, word knowledge, segmentation ability, letter-sound knowledge, and reading knowledge were administered. Results indicated that inventive spellers were superior in letter-sound knowledge and segmentation of words. Although significant differences were noted between nonspellers and inventive spellers on word-knowledge tasks, Burns and Richgels noted that, despite higher levels of phonological awareness, 56% of the invented spellers read words at a similar level to the nonspellers. Advantages in phonological awareness did not translate consistently into higher word reading scores. They concluded that, although phonological awareness and spelling ability are closely related, word reading ability is separate from spelling ability. Although both abilities are related to phonological awareness, the modes of input and output may influence performance capabilities.

Huxford et al. (1991) conducted a longitudinal investigation of the relationship between the abilities to read and to spell phonologically. Subjects were 43 4- and 5-year-old children who were tested at 8-week intervals on (a) measures of reading and spelling words and nonwords and (b) measures of segmentation and blending. The number of tests administered varied depending on the rate at which each child reached ceiling levels. The average time to reach ceiling levels was 28 weeks, with a range of 16 weeks to 1 year. The results of this series of tests indicated that spelling scores were consistently higher than reading scores. In addition, phonological segmentation scores were somewhat higher than blending scores. Huxford et al. determined that phonological spelling appears to precede phonological reading. They suggest that practice in phonological spelling should enhance early reading ability.

Effects of Instruction in Phonological Awareness on the Development of Reading Skills

Given that the relationship between phonological awareness and reading ability has been established, the question of improving phonological awareness must be addressed. If a child's level of phonological awareness is predictive of that child's reading ability, then can poor phonological awareness be remediated? If so, will remediation result in improved reading ability? The answers to these questions illustrate why phonological awareness research is considered a scientific success story (Stanovich, 1987). Numerous studies have documented the effectiveness of training in phonological awareness in the improvement of reading ability (Ball & Blachman, 1991; Lundberg, Frost, & Petersen, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993; Torgesen, Morgan, & Davis, 1992).

Results of Phonological Awareness Training Studies

The work of Elkonin (1963), a Russian psychologist, was perhaps the earliest documented training that dealt specifically with phonological awareness. Elkonin speculated that children must be able to hear, distinguish, and analyze the separate sounds in words to be able to learn to read. Subsequently, he created a training method that would allow for the development of these skills. Elkonin provided counters and pictures of objects with squares drawn beneath each picture representing the number of separate sounds in the word. The child was asked to segment the phonemes in the word while placing one counter in a square for each sound. This training resulted in increased abilities in phonemic segmentation and increased decoding skills.

Training methods similar to Elkonin's have been employed successfully in a number of subsequent studies by other researchers. Table 1 provides a compendium of several of the major training studies.

Table 1

Summary of Phonological Awareness Training Research

Study	Subjects	Intervention	Dependent Measures
O'Connor, Jenkins, Leicester, & Slocum (1993)	47 children (ages 4-6) with developmental delays, and significant language delays	Instruction in 13 phonemes (continuous and stop sounds); three categories of instruction - rhyming, blending, and segmenting	McCarthy Scales of Children's Abilities; nine subtests of auditory phonological skills (three each for rhyming, blending, and segmenting); letter recognition

Results: Subjects in each category of instruction made significant gains but demonstrated little or no generalization either within or between categories.

Table 1 - continued

<table>
<tr><th>Study</th><th>Subjects</th><th>Intervention</th><th>Dependent Measures</th></tr>
<tr><td>Byrne & Fielding-Barnsley (1990)
Exper. 1</td><td>16 preschool children, age range 47-61 months</td><td>instruction in phoneme identity and transfer</td><td>Performance on phoneme identity tasks and on letter-sound correspondence (within words) tasks was measured.</td></tr>
<tr><td colspan="4">Results: Univariate analyses revealed that the children were able to be taught to notice phonemic segments in words. Phoneme position in the word had no effect. The children consistently had difficulty with the /t/ sound. Transfer data revealed that students who performed at a high level on phonemic awareness were able to complete the transfer tasks correctly.</td></tr>
<tr><td>Exper. 2</td><td>16 preschool children, age range 48-58 months</td><td>training in segmentation</td><td>segmentation tasks, tasks of phoneme identity, tasks of letter-sound correspondence</td></tr>
<tr><td colspan="4">Results: Analysis revealed that the children were able to learn to segment words. The skills were less stable than the phoneme identity skills. Some of the children were able to succeed on the alphabetic transfer tasks, as well.</td></tr>
<tr><td>Exper. 3</td><td>36 children with a mean age of 54 months</td><td>phoneme identity instruction with phonemes in initial and final positions</td><td>transfer scores</td></tr>
<tr><td colspan="4">Results: No significant main effects were detected for group or for phoneme position (initial or final).</td></tr>
<tr><td>Exper. 4, 5, & 6</td><td>4 (n=15)
5 (n=14)
6 (n=12)
preschool children</td><td>training in phoneme identity with different target phonemes</td><td>phoneme identity tasks and transfer tasks</td></tr>
<tr><td colspan="4">Results: Continuant phonemes were acquired more readily than stops. Continuants were detected as well when a part of a consonant cluster as when it was a singleton.</td></tr>
</table>

Table 1 - continued

Study	Subjects	Intervention	Dependent Measures
Ball & Blachman (1991)	89 kindergarten students	Group 1 = phoneme awareness training with letter-sound instruction Group 2 = only letter-sound instruction Group 3 = control	Peabody Picture Vocabulary Test-Revised (Dunn, 1981); Word ID subtest of Woodcock Reading Mastery Test; tests of phoneme segmentation, letter-name and letter-sound knowledge; posttests of decodable word reading and spelling

Results: ANCOVA results indicated that students in the group that received letter-sound instruction paired with phoneme awareness made significantly greater gains in word identification and spelling than students in the control group or those in the group that received letter-sound instruction without phoneme awareness training. No significant gains were noted for the treatment group with no phoneme awareness training on measures of segmentation, early reading skills, or spelling skills.

Study	Subjects	Intervention	Dependent Measures
Haskell, Foorman, & Swank (1992)	48 first-grade students	4 groups: phonological awareness instruction at the whole-word level, onset-rime level, and phoneme level, and a no-treatment control group	word reading tasks using words with regular and nonregular spellings

Results: Students who received letter-sound instruction at either the phoneme or onset-rime level were more accurate on the word reading task. Subjects in the phoneme group read more regular words correctly, while subjects in the onset-rime group read exception words more accurately. The authors concluded that onset-rime training may foster flexibility in applications of spelling patterns, while phoneme training is more beneficial for reading words with regular spellings.

Table 1 - continued

Study	Subjects	Intervention	Dependent Measures
Lundberg, Frost, & Petersen (1988)	390 children (235 in treatment group, 155 control)	Longitudinal study (preschool through second grade) of the effects of phonological awareness training before beginning reading instruction	Reading and spelling measures

Results: Significant effects were observed on tasks involving rhyming, word and syllable manipulation, and phonemic segmentation. Significant reading and spelling effects were evident through second grade. Tasks requiring phonemic segmentation had the largest gains.

Study	Subjects	Intervention	Dependent Measures
Torgesen, Morgan, & Davis (1992)	48 kindergarten students	small-group training sessions 3 times per week for 7-8 weeks; three groups - blending and segmenting, blending only, language activities	Blending and segmenting tasks, word reading measure

Results: Subjects in the blending and segmenting group made significant gains on both types of skills, while children in the blending group improved only on blending skills. Children in the control group did not make significant gains in either area. In addition, only subjects in the analysis and synthesis group made gains on the word reading task.

Ball and Blachman (1991) investigated the effects of phonological awareness training on developmental spelling and on word recognition of kindergartners. Subjects were 89 kindergarten students who scored in the average range on a measure of verbal ability and who were, essentially, nonreaders. Subjects were randomly assigned to one of three groups. The first group received training in phonemic segmentation and letter-sound correspondences. The second group received training in only letter-sound correspondences. The control group received no intervention. On posttest measures of reading and spelling, subjects in the first group (phonemic segmentation and letter-sound correspondences) made significant gains. Subjects receiving training only in letter-sound correspondences did not improve significantly in reading or spelling. Ball and Blachman concluded that segmentation training, combined with instruction in letter-sound correspondences, can have a significant impact on early reading and spelling. A major limitation of this study was that training in phonemic segmentation without a letter-sound correspondence component was not included. Inclusion of this condition would have allowed a more useful comparison to determine the effect of letter-sound instruction.

Tangel and Blachman (1992) addressed this issue by training kindergarten children in phonemic awareness without letter-sound instruction. The results of this study indicated that those children who received phonemic awareness training demonstrated significantly better performance in segmentation, letter and sound knowledge, and word recognition than children in the control group. The children in the phonemic awareness training group exhibited significant improvement in invented spelling as well. Tangel and Blachman emphasized the role of phonemic awareness training in alerting children to the internal sound structure of words. They concluded that this awareness of word structure facilitates increases in reading and spelling skills.

Lundberg, Frost, and Petersen (1988) conducted a longitudinal study in which 235 Danish preschool children received 8 months of daily training sessions in phonological awareness. The reading and spelling progress of these subjects and a control group of 155 children was monitored through first and second grade. Significant effects were observed on tasks involving rhyming, word and syllable manipulation, and phonemic segmentation. The most dramatic effect was in phonemic segmentation. Significant reading and spelling effects were evident through second grade. By providing phonological awareness training before formal reading instruction had begun, Lundberg et al. were able to interpret more accurately the effectiveness of the training without the interaction effect of reading instruction. They concluded that phonological awareness training in preschool is effective and the effects on reading and spelling acquisition are maintained.

The knowledge that training in phonological awareness facilitates the acquisition of reading and spelling skills has prompted a surge of interest in phonological awareness research. Recent research has focused on identifying the salient features of phonological awareness training and determining the most effective training methods. Both informal methods and commercial programs have been addressed.

Methods, Skills, and Levels for Instruction

Many phonological awareness studies have emphasized the various aspects of instruction. Some researchers have examined the methods of or approaches to instruction. Others have concentrated on the skills addressed within instructional programs. Still others have investigated the levels of phonological awareness addressed. The following sections include a review of these training studies.

Analytic and synthetic methods. Torgesen, Morgan, and Davis (1992) investigated the effects of two types of phonological awareness training programs on the development of phonological awareness skills and on word learning. The subjects, 48 kindergartners, participated in small-group training sessions 3 times per week for 7-8 weeks. The subjects were matched for age and verbal ability and randomly assigned to one of three groups. The first group received phonological-awareness training that included both analysis (segmentation) and synthesis (blending) activities. The second group received training using only synthesis activities. The control group was exposed to a variety of language-experience activities. Subjects in the first group (analysis and synthesis) made significant gains on both types of skills, while children in the synthesis group improved only on blending skills. Children in the control group did not make significant gains in either area. In addition, only subjects in the analysis and synthesis group made gains on the word learning task. The generalization of training to word reading suggests that the phonological awareness of subjects in the first group was more easily accessible in new contexts as a result of their exposure to both types of tasks. Torgesen et al. concluded that phonological awareness training that includes both types of tasks provides a richer awareness of the phonological structure of words.

Rhyming, blending, segmenting. O'Connor, Jenkins, Leicester, and Slocum (1993) examined the differences among three categories of phonological tasks: rhyming, blending, and segmenting. Separate treatment programs, one emphasizing each task category, were developed. Forty-seven preschool students, ages 4-6, were randomly assigned to one of the three treatment groups or to a control group for 7 weeks of training. O'Connor et al. concluded that the subjects in each category of training made significant gains in the category in which they were trained. The children did not, however, demonstrate generalization of training within or between categories. In other words, children trained in rhyming did not learn to segment, children trained in segmenting did not improve their blending skills, and so on. The authors mentioned several limitations to this study, but the primary limitation was the type of training administered. Subjects were exposed to a limited set of words during training making generalization of skills difficult.

Uhry and Shepherd (1993) investigated the effects of segmentation and spelling instruction within the first grade reading program on measures of reading. Subjects were 22 first graders with average or above-average IQ (x=122.5). The experimental group received segmentation and spelling instruction while the control group received reading instruction that was characterized as a whole language approach with a limited phonics component. Following 6 months of training, groups were compared on a variety of reading measures. Uhry and Shepherd concluded that students who receive training in segmentation and spelling had an advantage in oral reading and analogy reading over students who lacked this training.

Whole words, onsets and rimes, or phonemes. Haskell, Foorman, and Swank (1992) examined whether the whole-word level, the onset-rime level, or the phoneme level of phonological awareness is more effective for instruction. Forty-eight first graders were randomly assigned to one of the three treatment groups or to the control group. Subjects participated in 15-minute sessions daily over a 6-week period. The independent variable, unit of training, was the only difference in the treatment of each group. Haskell et al. found that students who received letter-sound instruction at either the phoneme or onset-rime level were more accurate on a word reading task. The students in these two groups appeared to benefit from explicit instruction in letter-sound correspondences, instruction that subjects in the whole-word and control conditions did not receive. Subjects in the phoneme group read more regular words correctly, while subjects in the onset-rime group read exception words more accurately. Haskell et al. concluded that onset-rime training may foster flexibility in applications of spelling patterns, while phoneme training is more beneficial for reading words with regular spellings.

Letter-sound instruction. Instruction in letter-sound correspondences is the basis for most phonics programs. Phonics instruction has been the subject of much debate in the professional literature for decades, but proponents have generated much evidence in support of the inclusion of phonics during beginning reading instruction (Adams, 1990; Anderson et al., 1985; Chall, 1967).

Foorman, Francis, Novy, and Liberman (1991) examined the role of letter-sound instruction in first-grade reading and spelling. Eighty children in first-grade classrooms received differing amounts of letter-sound instruction. Performance on tests of phonemic segmentation, reading, and spelling was measured three times during the school year. Results of repeated measures analysis indicated that students in classrooms with more letter-sound instruction improved more rapidly in word reading and spelling. No significant differences were detected in phonemic segmentation ability. Beginning scores in phonemic segmentation, reading, and spelling were predictive of end-of-year scores in all areas. Foorman et al. concluded that, although students receiving more letter-sound instruction improved in reading and spelling, the lack of differences in phonemic segmentation ability remained a concern. The predictive value of phonemic segmentation ability indicates that training in phonological awareness combined with letter-sound instruction appears to be the more effective method of instruction.

Byrne and Fielding-Barnsley (1990) studied how recognition of phoneme identity and recognition of phoneme segmentation influence acquisition of the alphabetic principle in preliterate children. Six experiments, each with an *N* of between 12 and 16, were conducted to examine the effects of instruction in phoneme identity, segmentation, and phoneme position. Each experiment included target phonemes in different positions within the words. After the six experiments, Byrne and Fielding-Barnsley determined that preschool children can be taught to recognize the identity of phonemic segments of words and that the position of the target phoneme makes no difference. They also note that instruction in phoneme identity can, when paired with relevant letter-sound knowledge, promote acquisition of the alphabetic principle. The researchers suggested that phoneme identity is more readily learned than phonemic segmentation. Byrne and Fielding-Barnsley also noted that phoneme identity instruction should begin with continuant sounds rather than stops.

Commercial Programs

Several commercial reading programs have been combined with phonological awareness instruction. Other programs have been developed for the specific purpose of increasing students' phonological awareness. The following sections include a review of the investigations of these programs.

Reading Recovery. Iversen and Tunmer (1993) investigated the effects of phonological awareness training when incorporated into the Reading Recovery program. Subjects (*N*=96) were first-grade students who were considered at risk for reading failure based on kindergarten achievement. Matched groups were formed and each assigned to one of the three conditions: standard Reading Recovery, modified Reading Recovery (including phonological awareness training), and standard intervention (services normally available to at-risk readers). Both Reading Recovery groups made significantly greater gains on posttest measures. Although the two Reading Recovery groups performed at similar levels on posttest measures, subjects who received the modified Reading Recovery treatment (including phonological awareness training) reached criterion at a significantly faster rate. Iversen and Tunmer concluded that children with reading problems will be remediated much more quickly when systematic instruction in phonological awareness is included in their treatment.

Sound Foundations. Byrne and Fielding-Barnsley (1991a) evaluated a phonological awareness training program called Sound Foundations (Byrne & Fielding-Barnsley, 1991b). Subjects (*N*=126) were randomly assigned to the treatment or control group with groups equivalent on pretest measures of verbal ability and phonological awareness. The treatment group received training in identifying and matching five initial phonemes and participated in group activities involving these skills. The control group participated in similar activities without the phoneme training. The treatment group scored significantly higher than the control group on phoneme-identity measures of both trained and untrained phonemes. Byrne and Fielding-Barnsley (1991a) contended that recognition of phoneme identity can be effectively trained with this program. They also asserted that phoneme identity is a stable construct and that, because gains on both trained and untrained phonemes can be expected, there is no need for instructional programs to include all the phonemes of the language.

Auditory Discrimination in Depth. The A.D.D. Program, Auditory Discrimination in Depth (Lindamood & Lindamood, 1975), is one of the earliest published programs to address a child's phonological awareness. Kennedy and Backman (1993) compared the effectiveness of a comprehensive remedial program that included the A.D.D. Program with the comprehensive remedial program alone. The 10 subjects in the A.D.D. group received 75 hours of instruction in the A.D.D. Program (within the regular remedial reading program) over a 6-week period in addition to the remedial reading program. The 10 subjects in the control group received an equivalent amount of instruction in the regular remedial reading and spelling program. Subjects in the two groups were matched for IQ, chronological age, reading, spelling, and phonological awareness abilities. Students in the A.D.D. group achieved significantly greater gains in phonological awareness and phonetic spelling strategies. Both groups made significant gains on standardized reading and spelling measures and the gains were not significantly different by group.

In a review of training programs and procedures, Liberman, Shankweiler, and Liberman (1989) commended the A.D.D. Program for its success in helping the student to conceptualize the internal phonological structure of words by calling attention to the distinctiveness of the articulatory gestures for various phonemes. They observed the utility of the A.D.D. Program for developing phonological awareness and note that, although it is designed for individual remediation, the program can be adapted for classroom use.

Code-Emphasis vs. Meaning-Emphasis Approaches to Reading Instruction

The issue of code-emphasis versus meaning-emphasis approaches seems ubiquitous in the reading research literature. The distinction between the two approaches has been the recent focus in the debate about the appropriate method of beginning reading instruction (Carbo, 1988; Chall, 1989; K. Goodman, 1992; Y. Goodman, 1989; Stahl & Miller, 1989; Vellutino, 1991). Since the advent of whole language, the debate has intensified. The controversy has even been called the "reading wars" (Nicholson, 1992) and "paradigm wars" (Stanovich, 1990). Some researchers, however, have suggested a blending of the two approaches (Spiegel, 1992). Because instruction in phonological awareness appears bound by its very nature to the code-emphasis paradigm, consideration of the code-versus-meaning issue seems warranted in phonological awareness research.

Liberman and Liberman (1990) argued against the whole language assumption that learning to speak and learning to read are compatible instances of language development (K. Goodman, 1989). They described speech as a wholly natural, integral, and relatively effortless part of a child's specialization for language. Conversely, they described reading as a biologically secondary code that maps language in ways that must be consciously understood to be used properly. Liberman and Liberman also took issue with the whole language assumption that all children will discover the alphabetic principle without explicit instruction. They argued that as many as 25% need appropriate instruction to learn the alphabetic principle.

Felton (1993) analyzed the effects of code-emphasis and meaning-emphasis instruction on the decoding skills of children identified with one of three types of phonological processing problems. Eighty-one kindergartners were identified as at risk for reading disabilities. The children were identified as being weak or deficient in either phonological awareness, phonological encoding, or retrieval of phonological information. Following instruction, the children were tested on a variety of reading and spelling measures. The children who had received code-emphasis instruction outperformed the children who had received meaning-emphasis instruction on each measure. Children in the code-emphasis group demonstrated the ability to apply their knowledge of the alphabetic code to reading words. In comparison, some of the children in the meaning-emphasis group did not develop this ability and relied heavily on sight word knowledge and context/picture clues for word identification.

Advocates of one approach tend to besmirch the other without regard for its merits. Neither the code-emphasis nor the meaning-emphasis approach excludes the use of the other. Because the goal for both approaches is fluent reading, the approaches should not be considered irreconcilable opposites. A focus for research in beginning reading should be to develop methods that bring the best of the two approaches together without diluting the benefits of either. Application of connectionist theory to reading research may achieve this.

Connectionist Theory and Reading Instruction

Connectionist theory has become a popular approach to studying thinking and learning. Connectionism is considered an important addition to the field of cognitive science (Tienson, 1991). The connectionist approach is described in the following section. The subsequent sections explain the role of connectionist theory in reading research, with specific consideration of transfer and generalization, and the role of connectionism in research about phonological awareness instruction.

Connectionism

Connectionist theory has found considerable attention in the literature on cognitive psychology in the past decade. The new connectionism, not to be confused with Thorndike's connectionism, has generated thought, debate, and possible solutions to many problems in psychology. Connectionism may be understood in terms of Parallel Distributed Processing (PDP) models (McClelland, Rumelhart, & Hinton, 1986). The PDP models assume that information processing occurs through the interactions of processing elements called units. Units send excitatory and inhibitory signals to other units. In the PDP models, intelligence is the result of the transmission of activation in large networks of densely interconnected units (Pinker & Mehler, 1988). Learning is the strengthening of the associations between units (McClelland, Rumelhart, & Hinton, 1986).

The PDP models do not view the goal of learning to be the formulation of explicit rules but the acquisition of connection strengths to allow a network of units to act as though it knew the rules. What a unit represents can change with experience. The system, therefore, is constantly evolving based on new experiences and adjustments in the strength of connections (McClelland, Rumelhart, & Hinton, 1986).

According to McClelland et al. (1986), the roots of the new connectionism may be traced to the work of Luria and, later, Hebb and Lashley. These psychologists envisioned cognitive processes that resulted from the coordination of large networks of components. Lashley, a comparative psychologist, was the first to insist upon distributed processing within the neural network. These shifts in thinking for cognitive psychologists formed the foundation of the new connectionism.

Within the realm of reading instruction, units can be individual sounds or words, letters or word meanings. The knowledge gained through reading instruction is the association between a sound and a letter or a word and its meaning. Instruction is designed to strengthen these associations to the point where they can be applied in new situations.

Adams (1990) proposed the connectionist framework as a foundation for understanding reading and, in particular, human word recognition performance. Adams envisioned connectionism as a "bridge between empiricist and nativist views of knowledge" (p.201). Connectionist theory as a basis for the design of reading instruction allows the facilitation of learning through activation of associations and, as in Yopp and Singer's (1985) Interactive Reading Instructional Model, the instructor and learner share responsibility for this activation. The instructor's role in activating phonological awareness must be explicit.

As Bereiter (1991) explained, connectionist models attempt to illustrate "how approximations to rule-based behavior can be achieved through processes that do not involve rules as agents in the process" (p. 11). In other words, rules for associations are an unnecessary component in the formation or strengthening of associations. According to Bereiter, although both the new connectionism and Thorndike's connectionism regard knowledge as an enormous network of interrelated elements, the two theories differ in several ways. Most significantly, in Thorndike's connectionism the elements themselves are the significant features of knowledge, while the connections serve to elicit cognitive associations. In the new connectionism, the elements are insignificant themselves because "the knowledge is in the connections" (Rumelhart & McClelland, 1986, p. 132).

Adams (1990) explained that "through language, novel concepts can only be communicated in the form of novel combinations of familiar concepts" (p. 205). In other words, to make a concept meaningful, present it in a familiar context and relate it to prior knowledge. The new connection then becomes the new knowledge.

Bereiter (1991) characterized academic rules from a connectionist perspective. He explained that an academic rule that is acquired may be only a complex or a pattern of connections that approximates rule-based performance, meaning that the rules that students learn are not the same as the rules that they are taught. A focus in education has been for students to remember and to apply rules. Acquisition of procedural knowledge has been a primary goal. What Bereiter suggests is an alternative view: rules as a channel for discourse or as a way of understanding rather than an end in themselves. He contended that rules and principles may be fully understood only "*after* students have acquired the competence that the rules formalize" (p. 15). The application of rules in context *during* the learning process is essential for connections to be formed.

The Role of Connectionist Theory in Reading Instruction and Research

The idea of understanding being influenced by the context in which it is achieved has received significant attention in the literature relating to reading comprehension and word recognition (Biemiller, 1970; Goldsmith-Phillips, 1989; Goodman, 1965; Nicholson, 1991; Nicholson, Bailey, & McArthur, 1991). The idea has been applied relatively sparingly, however, in the area of beginning reading (Adams, 1990). In reading acquisition, during which children are required to make enormous gains in arbitrary associations of sounds and letters, educators might gain insight using this perspective.

Adams (1990) characterized meaningful context as an essential component of reading skill instruction. She explained that context is the mode through which connections between skill acquisition and skill application are formed.

Generalization and Transfer. Research on generalization and transfer of training in reading supports the application of knowledge in a variety of the contexts in which it may be used (Garner, Alexander, & Hare, 1991; Stokes & Baer, 1977; Williams, 1984). Instruction in a variety of contexts allows the learner a more flexible knowledge and, therefore, new connections may be more easily formed. The connections being formed and strengthened during learning are more like the connections required in the application of the new knowledge. The similarity of the initial connection to the connection made during application makes learning more efficient by facilitating the use of the newly acquired knowledge.

Barnden (1992) explained the need for explicit generalizations in connectionist systems. Explicit generalizations may be needed to feed into other inference processes, including application in novel situations. In the case of generalization of phonological awareness training, explicit generalizations allow the reader to apply phonological knowledge to decoding during reading of connected text. If such an application of phonological knowledge facilitates fluent reading, enhanced comprehension is likely to result. Barnden also explained that, to enable explicit generalization, an activity pattern during learning must explicitly represent generalization. According to Carnine, Silbert, and Kameenui (1990), explicit instruction is essential for students to make the associations they need for both skill acquisition and for generalization. As explained by Stokes and Baer (1977), instruction should mediate generalization by eliciting responses in meaningful contexts.

Connectionist theory in phonological awareness instruction. According to Barnden's (1992) assertions about the facilitation of explicit generalization, phonological awareness instruction should incorporate an contextual application component. The generalized activity pattern that Barnden described would be the application of phonological skills during the reading of connected text.

Balota, Ferraro, and Connor (1991) recognized the role of meaning in the development of word recognition skills and maintained that meaning contributes to early word recognition. Balota et al. explained that models of instruction that rely on only orthographic or phonological processing ignore the contribution of meaning. They emphasize the need for consideration of meaning-level influences in word identification.

Studies in phonological awareness have only recently begun to compare training methods to determine the critical components. Although many researchers have measured progress in generalized skills (e.g., word recognition, decoding, reading fluency) following phonological awareness training, few researchers have addressed the issue of training for generalization (Byrne & Fielding-Barnsley, 1991a; Rivers, Lombardino, & Thompson, 1993). If, however, connections are formed more easily when skills are taught in context (Adams, 1990; Bereiter, 1991; Cunningham, 1990), and generalization occurs more readily when a variety of contexts are used (Garner, Alexander, & Hare, 1991; Williams, 1986), then an application of connectionist theory to phonological awareness training would appear to be a logical means of increasing learning and generalization. As Torgesen and Morgan (1990) aver, phonological awareness may remain as inert knowledge until the application in word construction is made explicit.

Implications for Research

The literature reviewed in this chapter provides a theoretical and empirical basis for this study. Research has demonstrated that phonological awareness is an essential component to successful beginning reading. Training studies have confirmed the benefits of phonological awareness training. Recent studies have examined alternate forms of phonological awareness instruction in an effort to improve current methods.

Connectionist theory provides a basis for reasonable alternatives to current methods. The formation of linguistic connections is at the core of phonological awareness development. By facilitating the formation and strengthening of new connections through the use of context in phonological awareness instruction, teachers may be able to accommodate the learning needs of their students more effectively.

This study builds on the existing research base by examining the effects of a previously neglected aspect of phonological awareness instruction--explicit instruction in contextual application of phonological skills. The basis of this approach in connectionist theory allows for an analysis of the role connectionism might play in beginning reading instruction.

CHAPTER III
METHODS AND PROCEDURES

Introduction

The purpose of this study was to determine the effects of context in phonological awareness instruction. In Chapter III, the methods and procedures of the study are presented. The chapter begins with the hypotheses that were addressed. The second section is a description of the methods, which includes descriptions of the subjects, sampling procedures, and measures. The subsequent sections include descriptions of the experimental design, the instructional procedures and the treatment of the data.

Hypotheses

A study of the effects of explicit instruction in contextual application within phonological awareness instruction was implemented. The general question of the study was as follows: Does explicit instruction in the application of phonological awareness skills in the context they are used affect the acquisition and use of the skills? To address this question, the following null hypotheses were tested at the .05 level of confidence:

H_1: There will be no statistically significant difference on measures of phonological awareness, including elision, sound matching, blending, and segmentation between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application.

H_2: There will be no statistically significant difference on measures of passage reading fluency between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application.

H_3: There will be no statistically significant difference on measures of reading comprehension between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application.

H_4: There will be no statistically significant difference on measures of decodable word recognition between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application.

H_5: There will be no statistically significant difference on measures of decodable nonword recognition between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application.

Methods

The research methods are described in this section. The settings and subjects section includes a description of the school settings, sampling technique, selection criteria, and subjects. The description of the research instrumentation includes a description of the screening measures and the pretest/posttest measures. A description of the treatment procedures for the experimental and comparison groups is included, as well. Finally, a description of the design and analysis is provided.

Settings and Subjects

This section includes a description of the instructional settings and of the subjects. The setting description includes information about each school. The subject description includes demographic information by school and by group. An explanation of sampling and assignment procedures is also provided.

Instructional settings

Three schools were selected as sites for this study: two public elementary schools and a university laboratory school. Because socioeconomic status is a predictor of phonological awareness level (Adams, 1990), the schools for this study were chosen based on the socioeconomic status of the general school population. The use of socioeconomic status to select school sites ensured that a sufficient number of students at each school would qualify for inclusion in the study.

Because socioeconomic status is a predictor of reading and reading-related skills (Adams, 1990), the socioeconomic status of the student populations of the schools in this study was considered. Schools with student populations that had a low overall socioeconomic status were thought to be better sources of qualified subjects, i.e., subjects with weak phonological awareness. The socioeconomic status of each school population was determined by calculating the percentage of students at the school participating in the free or fee-reduced lunch program. In School 1, 79% of the first-grade students participated in the free and fee-reduced lunch program. In School 2, 59% of the first-grade students participated in the free and fee-reduced lunch program. The student population at School 3, the university laboratory school, is intended to reflect the socioeconomic status of the surrounding community of north central Florida. In School 3, 29% of the first-grade students participated in the free and fee-reduced lunch program. The specific percentage of students at each school who participate in the free or fee-reduced lunch program is reported in Table 2. The socioeconomic status of individual students was not considered as a factor in this study.

Subject description

Forty-three first-grade students participated in the study. A systematic sampling technique was employed. All first graders in the three schools were screened on a test of invented spelling described in this chapter. The children

Table 2

Description of Socioeconomic Status of Schools

School	% of first-grade students that receive fee-reduced lunch	% of first-grade students that receive free lunch
1	6	73
2	7	52
3	16	13

who scored below the designated score on the screening instrument were selected as potential participants in the study. Teachers were asked to identify those students who had poor attendance records or who, for any other reason, may not be able to complete the entire instructional process. These children were eliminated from the pool of potential participants. Parental informed consent for participation was obtained for the remaining students as required by the University of Florida Institutional Review Board (See Appendix A).

Using the described procedures, consent was obtained in time for 46 students to participate in the study. One of the students who was pretested relocated during the study and was unable to complete the intervention. Two other students were frequently absent from school and, therefore, missed too many days of the intervention to be included in the data analysis. The pretest results of these three students were also eliminated from the data summary.

The remaining 43 subjects participated in the entire intervention phase and in the posttest phase of the study. A summary of the demographic information from the 43 subjects is presented by school in Table 3. Table 3 also includes the group assignment of subjects from each school.

Table 3
Descriptive Information for Subjects by School

		School 1	School 2	School 3	Total
Gender:	male	9	3	8	20
	female	5	10	8	23
Race:	black	8	9	6	23
	white	6	4	10	20
Group assignment:					
	experimental	9	5	8	22
	comparison	5	8	8	21

From the remaining 43 subjects, an experimental group and a comparison group were formed. Assignment to experimental or comparison group was random within the following constraints: The two groups must have equivalent mean pretest scores on measures of total phonological awareness and verbal ability. The demographic information for the two groups is presented in Table 4.

Through the use of random assignment, differences between the groups on the dependent variables could be more confidently attributed to the independent variable. Although adjustments in assignments were made due to classroom scheduling restraints, the two groups remained equivalent in demographic makeup and on pretest measures of total phonological awareness and verbal ability. Table 5 provides a summary of the pretest data for each group.

Table 4

Descriptive Information for Groups

		Experimental Group	Comparison Group
Gender:	male	8	12
	female	14	9
Race:	black	11	12
	white	11	9
SES:	free lunch	11	9
	fee-reduced lunch	5	5
	no lunch program	6	7
School:	1	9	5
	2	5	8
	3	8	8

Table 5

Pretest Means for Experimental and Comparison Groups

Pretest Measure	Means for Experimental Group	Means for Comparison Group
PPVT-R	97.0	99.2
Phonological Awareness:		
elision	10.0	8.7
sound matching	9.5	11.5
blending	10.6	10.9
segmentation	5.7	5.4
total PA score	36.0	36.6
word 1	11.5	12.3
word 2	10.6	12.9
nonword 1	6.2	7.6
nonword 2	5.0	6.2
reading fluency	21.9	26.4
reading comprehension	3.4	3.8

Research Instrumentation

The research instruments used in this study included the screening measure, the pretest measures, and the posttest measures. Each measure was selected based on previous studies in the area of phonological awareness. In addition, questionnaires and follow-up interviews were used to determine the extent of student and teacher satisfaction with the intervention.

Screening Measure

The nature of the instruction suggested that the subjects for this study should be those students who had low beginning levels of phonological awareness. A screening instrument was, therefore, administered to identify potential subjects. The screening instrument was a measure of invented spelling similar to that described by Mann, Tobin, and Wilson (1987). The phonological scoring system outlined by Mann et al. was used as well.

Teachers were provided with directions for administration of the tests. Each teacher administered the test to her own class. The tests were coded so that teachers could identify the students whose scores qualified for participation. The test included a section on words and a section on nonwords.

Invented spelling of words

On the word portion of the instrument (See Appendix B), the teacher read each word aloud, read a sentence using the word, and read the word again. Students were asked to spell each of the 20 words as well as they could. More specifically, students were directed to spell words as they sounded. The teachers were permitted to repeat the words as necessary. The items on the word portion of the screening instrument were selected based on their representation of common English phonological elements.

Invented spelling of nonwords

On the nonword portion of the screening instrument (See Appendix B), students were asked to spell 20 nonwords with common English phonological patterns. On this portion of the test, the teacher read each nonword three times. A pronunciation guide for each nonword was provided for the teachers.

Scoring of invented spellings

The invented spelling tests were scored for phonological accuracy using the following scoring procedure. The scoring procedure allows children to receive up to four points for each word written. No points are given for responses that fail to represent any of the phonological elements within the given word. One half of a point is given for single letter responses that provide a part of the word other than the initial phoneme. One point is awarded for a single letter response that represents the initial phoneme in the word. Two points are awarded for spellings of two or more letters that represent phonemes within the word. Three points are given for preconventional spellings that represent the phonemic structure of the entire word. Four points are awarded for responses that are correct conventional spellings.

A total of 80 points were available on each portion of the test. A score of 40 or below indicated spellings that represented extremely limited phonological knowledge. The children who received a score of 40 or below on the word portion of the invented spelling test were automatically selected as potential participants. For those children who scored between 40 and 50 points on the word portion of the test, the nonword portion was used as a secondary selection criterion. The secondary criterion was intended to prevent the exclusion from the study of students who had adequate sight word knowledge but poor phonological skills. Each student who scored 50 or below on the word portion and 40 or below on the nonword portion were included in the pool of potential participants.

Pretest Measures

Pretest measures assessed general verbal ability, word reading, nonword reading, passage reading fluency, reading comprehension, and phonological awareness. The specific areas of phonological awareness assessed included elision, sound matching, blending, and segmentation.

Verbal ability

To assess the general verbal ability of the subjects, the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) was administered. During administration of the PPVT-R, subjects are asked to indicate which of four pictures best represents a given vocabulary word. Verbal ability scores form the PPVT-R were used to ensure that the two groups were equivalent.

The PPVT-R is designed to measure vocabulary knowledge which is considered to be a reliable indicator of verbal ability and a predictor of school performance. Slate, Jones, Graham, and Bower (1994) found a significant correlation [$r(63) = 59$, $p < .01$] between PPVT-R scores and Verbal IQ scores on the Wechsler Intelligence Scale for Children-III (WISC-III; Wechsler, 1991) for children with learning disabilities. Slate et al. also found a significant correlation [$r(63) = 58$, $p < .01$] between PPVT-R scores and Full Scale IQ scores on the WISC-III.

Phonological awareness

The second set of pretest measures was used to address phonological awareness. The measures of phonological awareness included tasks in elision, sound matching, blending, and segmenting (See Appendix C). The measures had been field tested with 100 randomly selected students at each grade level from kindergarten through fifth grade in Tallahassee, Florida (J. Torgesen, personal communication). Reliability figures for each measure at the first-grade level are presented in Table 6.

Elision. In the elision test, subjects are asked to repeat a word said by the examiner and then to say the word deleting a designated portion (e.g. "Say *cat*. Now say *cat* without saying the /k/ sound."). The instrument consisted of

Table 6

Reliability Data for Pretest Measures of Phonological Awareness

Measure	Mean	Standard Deviation	Reliability Coefficient
Elision	12.30	5.01	.91
Sound Matching	13.47	4.37	.84
Blending	14.75	6.06	.92
Segmentation	8.75	3.46	.82

Note. No information was available for first-grade students on segmentation test. Data provided for the segmentation measure are second-grade norms.

5 practice items and 25 test items. The deletion tasks began at the word level and progressed to the phoneme level.

Sound matching. The sound-matching test involved the oral presentation of a series of three-, four-, and five-letter words. The subjects were required to detect which word in the series shared a beginning or ending phoneme with a given word. The instrument consisted of three practice items and ten test items for beginning sounds and the same number of items for ending sounds.

Blending. The blending test required subjects to combine word parts to form a real word (e.g. /k/+/a/+/t/ = cat). The test items progressed from the syllable level to the phoneme level. Five practice items were provided followed by 29 test items.

Segmentation. On the segmenting test, subjects were asked to segment words into individual phonemes (e.g. cat = /k/+/a/+/t/). The test began with three two-phoneme practice items and with eight two-phoneme test items. The test continued with 3 practice items with longer words and 17 additional test items.

On each phonological awareness test, subjects were provided with corrective feedback during the practice items to ensure understanding of the task requirements. No feedback was provided during the test items. The examiner's portion of the tests were scripted to ensure proper administration.

Decodable words and nonwords

The measures of word and nonword reading ability consisted of a series of 1-minute timings (See Appendix D). The probe used for each timing was composed of a series of three-letter decodable words or nonwords with consonant-vowel-consonant (CVC) combinations. The first timing, Word 1, included only CVC words with *a*, *o*, and *u*. The second timing, Word 2, included words with *e* and *i*, as well. The nonword timings included letter combinations that followed common English phonological rules but that were not real words. The Nonword 1 and 2 timings followed the same vowel pattern as Word 1 and 2. Subjects were asked to read across the page saying as many words or nonwords as they could in 1 minute. Subjects were allowed to pass on words they could not decode, but passed words were counted as incorrect.

Reading fluency

The oral reading fluency of each subject was measured with a timing of passage reading. Subjects were given a 181-word first-grade passage from the Qualitative Reading Inventory (QRI; Leslie & Caldwell, 1990). The passage was a goal-based narrative with a typical story structure. Subjects were asked to read as quickly and as accurately as they could through the passage. Although each subject was given up to 3 minutes to complete as much of the passage as possible, the number of words read correctly in 1 minute was recorded as the subject's oral reading fluency score.

Reading comprehension

Reading comprehension was measured following the oral reading of the fluency passage. Each subject was asked to provide an oral retelling of the story. No time limit was enforced during the oral retell. The QRI included a list of correct details for the passage, and each correct detail that the subject recalled from the story was recorded. The number of correct details constituted the subject's reading comprehension score.

Posttest Measures

Posttests were administered to each subject at the conclusion of the instruction. The posttest consisted of all of the same measures used for the pretest except for the measure of verbal ability. Phonological awareness (elision, sound matching, blending, and segmentation), word reading, nonword reading, reading fluency, and reading comprehension were assessed according to the same procedures outlined in the description of the pretest.

Experimental Design

An experimental pretest-posttest control-group design was employed for this study. This design allowed for control of threats to internal validity (Mason & Bramble, 1989). The pretest-posttest control group design was considered more appropriate than the posttest-only control group design because it allowed the assessment of changes in the dependent variables over time. This study did not include a no-treatment control group because the effects of phonological awareness instruction versus no instruction have been well established in previous studies (e.g., Ball & Blachman, 1991; Lundberg, Frost, & Petersen, 1988).

Instructional Procedures

The instructional procedures are described in this section. First, the selection and training of instructors are outlined. The following sections include an account of various aspects of the instructional sessions.

Instructor Preparation

Each of the instructors was a student in the College of Education at the University of Florida. The instructors were required to attend training sessions conducted by the researcher and to demonstrate mastery of each procedure. To limit teacher effects, the instructors were rotated between instructional groups so that each instructor spent time working with groups in each condition. Observations of instructors were conducted during sessions in both conditions. Procedural reliability checks were conducted to ensure adherence to the prescribed instructional procedure.

Procedures for Instructional Sessions

Instructional sessions were held two to three days each week during the subjects' regular period for reading instruction. The series of eighteen instructional sessions was conducted over an 8-week period. Each session lasted for approximately 20 minutes. The number and length of the sessions were the same throughout the study for the experimental group and for the comparison group. Makeup sessions were held for those students who missed three or more instructional sessions.

Instructional sessions in both conditions included two passage reading segments and a phonological awareness development segment. The presentation of skills was conducted using the direct instruction procedures described by Carnine, Silbert, and Kameenui (1990). The treatment for the experimental and comparison groups was identical with one exception. During each regular instructional session, the subjects who were in the experimental group received explicit instruction in the contextual application of the phonological skills. The subjects in the comparison group received no instruction related to the application of their phonological skills. A more detailed description of the instructional sessions in both conditions is provided in the following sections.

Preliminary sessions

Three preliminary sessions were held to introduce all subjects in both groups to the phonological awareness activities. During the preliminary sessions, the concepts of blending and segmentation were introduced using a procedure adapted from Torgesen and Bryant (1994). The instructor showed the subjects a picture of a robot and explained that the robot could only say words or understand words when they were said one sound at a time. For the blending tasks the instructor, in the role of the robot, said words by isolating each phoneme. The subjects were asked to tell what the "robot" had said, a task that required blending the phonemes. For the segmenting tasks, the subjects were provided with a word containing multiple phonemes. The subjects were asked to say the word so that the robot could understand (segmented phonemes). During each preliminary session, each subject was given several opportunities to respond so that the instructor could check for understanding of the blending and segmentation procedures. During the preliminary sessions, subjects from both groups received identical instruction as an introduction to the phonological awareness tasks. The instructor's script for the preliminary sessions may be found in Appendix E.

Regular sessions

Fifteen regular instructional sessions were held for each group. Each regular instructional session began with passage reading. The passage reading was followed by instruction in phonological skills. Each session concluded with a final reading of the passage. The instructor's script for the regular sessions may be found in Appendix F.

Passage reading. The subjects in both groups participated in passage reading at the beginning of each regular session. During the passage reading segment of the intervention, the instructor modeled fluent reading of the selected passage. The subjects then participated in an echo reading activity in which the instructor read one line of the passage and the subject followed by reading the same line. The third reading of the passage was a choral reading with the instructor and subjects reading the passage simultaneously. This portion of the passage reading segment of the intervention was the same for both groups.

Each passage contained multiple occurrences of a target phonological element. The subjects in the experimental condition were directed to attend to this element during the third reading of the passage. For the experimental group, the words for the phonological tasks were selected directly from the passage. The connection between the passage reading and the phonological tasks was, therefore, made explicit for subjects in the experimental group. No connection between the passage reading and the phonological tasks was made for the subjects in the comparison group.

After the third reading of the passage, the instructor led the subjects in the phonological awareness tasks. Following the phonological awareness activities, the subjects and the instructor completed another choral reading of the passage. During the final choral reading of the passage, subjects in the experimental group were directed to pause at each word with the target phonological element and to segment and blend the word. Subjects in the comparison group read through the passage without such pauses. The passages and target sound lists may be found in Appendix G.

Phonological awareness tasks. The phonological tasks consisted of blending, segmenting, and rhyming activities. The instructor modeled, conducted group guided practice, and conducted individual guided practice with each task. The instructor provided each subject with multiple opportunities to respond with each task. When an error was noted in a subject's response, the instructor modeled the correct response, led the subject in the correct response, and conducted immediate and delayed testing of the correct response.

Subjects in both groups were taught to blend phonemes and to segment words into individual phonemes using the described procedures. Differences between the instructional sessions for the two groups were limited to the presence or absence of the contextual application component described in the following section.

Connections. For the experimental group, the connection between the phonological tasks and the passage reading was made explicit. The instructor demonstrated the connection by indicating the target phonological element and assisting subjects in finding each word in the passage that contained that element. The instructor also demonstrated the connection by directing subjects to notice the words and to blend and segment the phonemes as they read the passage again at the conclusion of the session. This practice in the contextual application of phonological skills occurred only during instructional sessions with subjects in the experimental group.

For the comparison group, the words used during the phonological tasks were not from the passage read during that day's session. The words were from the passages used, as in the experimental group, but the words and the corresponding passages were not used on the same day for the comparison group. No connection between the words used and the passage reading was indicated by the instructor. No practice in the contextual application of phonological skills was included during instructional sessions with the comparison group.

The two groups were allotted equal time for passage reading and phonological awareness instruction. The single difference between the two types of instruction was the inclusion of explicit instruction in contextual application of the phonological awareness skills in the instruction of the experimental group.

Reinforcement. To encourage subject participation and effort during the instructional sessions, reinforcement was offered to the subjects. Subjects had the opportunity to earn stickers on a progress chart during each session. The charts were similar to those used in the subjects' classrooms. At the conclusion of the intervention and following the posttest, the charts were given to the subjects' classroom teachers to be distributed and taken home.

Treatment of the Data

The data were analyzed to determine if any significant differences existed between the experimental (instruction with contextual application) and comparison (instruction without contextual application) groups on any of the measures. Baseline data, including the mean for each group on each of the pretest measures, were collected at the outset of the study. The pretest means were compared to determine if there were any significant differences between the groups on the pretest measures. A series of analyses of covariance (ANCOVAs) were conducted on each of the dependent measures: elision, sound matching, blending, segmentation, phonological awareness total, word decoding (1 and 2), nonword decoding (1 and 2), reading fluency, and reading comprehension. The independent variable for each of these ANCOVAs was group (experimental vs. comparison). The covariate was the corresponding pretest. Table 7 contains an illustration of the comparisons made during the analyses of covariance for each hypothesis. In addition, Pearson correlation coefficients between the dependent variables by group (experimental and comparison) and by time (pretest and posttest) were computed to illustrate the relationships.

Several follow-up analyses were conducted to investigate further any differences between the groups.

Table 7

Design for Testing the Null Hypotheses using a Series of Analyses of Covariance (ANCOVAs)

Dependent Measures	Experimental Group		Comparison Group	
	Pretest	Posttest	Pretest	Posttest
1 - Elision 2 - Sound Match 3 - Blending 4 - Segmenting 5 - P.A. Total	H_1: There will be no statistically significant difference between the groups on measures of phonological awareness.			
6 - Reading Fluency	H_2: There will be no statistically significant difference between the groups on measures of passage reading fluency.			
7 - Reading Comprehension	H_3: There will be no statistically significant difference between the groups on measures of reading comprehension.			
8 - Word 1 9 - Word 2	H_4: There will be no statistically significant difference between the groups on measures of decodable word recognition.			
10 - Nonword 1 11 - Nonword 2	H_5: There will be no statistically significant difference between the groups on measures of decodable nonword recognition.			

CHAPTER IV
RESULTS

Introduction

The purpose of this study was to investigate the effects of explicit instruction in the contextual application of phonological skills on decoding, reading fluency, reading comprehension, and development of phonological awareness. Five hypotheses were formulated and tested. The general question of the study was as follows: Does explicit instruction in the application of phonological awareness skills in the context they are used affect the acquisition and use of the skills? To investigate this question, the performance of the experimental group, which received phonological awareness instruction with the context component, was compared to the performance of the comparison group, which received phonological awareness instruction with no contextual application. The effects of both types of instruction on the reading and reading related skills of first-grade students were measured and compared.

This chapter contains the results of the statistical analyses of data from this study. First, the reliability of measurement and instructional procedures is provided. Second, the statistical model is described and the results of the data analyses are reported. Third, the related findings are presented. Finally, results of the social validation measures are furnished.

Reliability of Measurement and Instructional Procedures

Procedures were implemented during the study to establish the reliability of measurement and instructional procedures. Interscorer agreement checks were used to obtain reliability information on the screening, pretest, and posttest scores. In addition, procedural reliability checks were executed to insure the integrity of the differences between treatments.

Interscorer Agreement

To establish interscorer agreement, each pretest and posttest was scored by two scorers using the same scoring procedures. Each screening instrument with a score that met selection criteria was checked for interscorer reliability, as well. Interscorer agreement was calculated using the formula recommended by Tawney and Gast (1984):

$$\frac{\text{Agreements}}{\text{Agreements + Disagreements}} \text{ X } 100 = \text{Percent of Agreement}$$

Interscorer agreement on the screening instrument was 98%. Interscorer agreement on the pretests was 96%. Interscorer agreement on the posttests was 100%.

Procedural Reliability

To ensure procedural reliability during the instructional phase, two observers viewed the implementation of eight instructional sessions in the experimental condition and six instructional sessions in the comparison condition.

The observers used an observation form (see Appendix H) to record the occurrence of explicit instruction in contextual application of phonological awareness skills during instructional sessions.

In the experimental condition, the observers recorded the occurrence of contextual application. During each of the eight observed sessions, appropriate instruction in explicit contextual application of phonological awareness skills was observed.

To ensure that instruction in contextual application did not occur in the comparison condition, the observers attended six instructional sessions. No instruction in the contextual application of phonological awareness skills was observed in the comparison condition.

Statistical Analysis of the Data

The data were analyzed to determine if any differences existed between the experimental (context) and comparison (no context) groups on any of the measures. This section includes a description of the analyses and the results achieved.

Several analyses were completed to determine if there were any preexisting differences between the experimental and comparison groups. A chi-square (χ^2) test was used to compare the two groups by race and gender. The χ^2 revealed no differences between groups by race ($\chi^2 = .22, 1, p = .639$) or by gender ($\chi^2 = 1.865, 1, p = .172$). Table 8 provides a summary of the distribution of subjects into groups by gender and by race.

Table 8

Distribution of Subjects by Race and Gender

Group	Female	Male	Black	White
Experimental	14	8	11	11
Comparison	9	12	12	9

The means of pretest scores for experimental and comparison groups were calculated. Using *t*-tests, the pretest scores of the experimental and comparison groups were compared to determine if any differences between the groups existed. No significant differences between the two groups' pretest means were found. Table 9 includes the means and standard deviations for the two groups and *t*-test results from the comparison.

Because the experimental and comparison groups demonstrated no significant differences on the pretest, the use of the pretest measures as covariates was appropriate to reduce the size of the error term (Keppel, 1982). An analysis of covariance (ANCOVA) was conducted for each of the dependent measures: elision, sound matching, blending, segmentation, phonological awareness total, word decoding (1 only), nonword decoding (1 and 2), reading fluency, and reading comprehension. The independent variable for each of these ANCOVAs was group (experimental vs. comparison). The covariate was the corresponding pretest.

Table 9

Comparison of Pretest Means by Group

Dependent Measure	Experimental Group (*n*=22) Mean (Std. Dev.)	Comparison Group (*n*=21) Mean (Std. Dev.)	*t*	*df*	*p*
PPVT-R	97.1 (15.1)	99.2 (13.7)	.4898	41	.6277
PA total	36.0 (9.6)	36.6 (9.9)	.2094	41	.8351
elision	10.1 (2.7)	8.7 (2.7)	1.6791	41	.1007
sound matching	9.5 (4.0)	11.6 (3.9)	1.6853	41	.0995
blending	10.6 (2.4)	10.9 (2.6)	.4129	41	.6818
segment	5.8 (2.6)	5.4 (3.9)	.3309	41	.7349
word 1	11.5 (7.7)	12.4 (11.2)	.3018	41	.7643
word 2	10.6 (6.9)	12.9 (15.2)	.6234	27.7	.5381
nonword 1	6.2 (4.9)	7.6 (5.4)	.8853	41	.3812
nonword 2	5.1 (4.6)	6.2 (5.3)	.7585	41	.4525
fluency	22.0 (20.7)	26.5 (30.3)	.5724	41	.5701
comprehension	3.4 (3.2)	3.9 (2.5)	.5086	41	.6138

Before the ANCOVAs were conducted, the assumption of homogeneity of the slope was tested. A violation of this assumption was found for the second word decoding measure (word 2) [*F*(1,40) = 23.65, *p* < .0001], which negated the use of ANCOVA (Keppel, 1982). No other dependent measure was found to violate the assumption of homogeneity of slopes. Therefore, ANCOVA was an appropriate analysis for the other dependent measures. The results of the ANCOVA for each of the remaining dependent variables are provided in Tables 10 through 19.

Table 10

Summary of Analysis of Covariance for Elision Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	1.500	0.14	.7080
Elision	1	220.251	20.89	.0001*
Error	40	668.511		

*Significant at the *p*<.05 level.

Table 11

Summary of Analysis of Covariance for Sound Matching Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	27.423	1.71	.1979
Sound Matching	1	258.320	16.15	.0003*
Error	40	899.674		

*Significant at the *p*<.05 level.

Table 12

Summary of Analysis of Covariance for Blending Task

Source of Variation	df	Sum of Squares	F	p
Group (experimental, comparison)	1	48.646	2.66	.1109
Blending	1	217.712	11.89	.0013*
Error	40	986.465		

*Significant at the p<.05 level.

Table 13

Summary of Analysis of Covariance for Segmentation Task

Source of Variation	df	Sum of Squares	F	p
Group (experimental, comparison)	1	11.878	0.77	.3846
Segmentation	1	43.587	2.84	.1000
Error	40	672.790		

Table 14

Summary of Analysis of Covariance for Phonological Awareness Total

Source of Variation	df	Sum of Squares	F	p
Group (experimental, comparison)	1	315.800	2.31	.1367
PA Total	1	2383.524	17.41	.0002*
Error	40	43030.279		

*Significant at the p<.05 level.

Table 15

Summary of Analysis of Covariance for Decodable Word (1) Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	4.560	0.06	.8040
Word 1	1	6323.031	152.09	.0001*
Error	40	7988.604		

*Significant at the p<.05 level.

Table 16

Summary of Analysis of Covariance for Decodable Nonword (1) Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	15.331	1.21	.2779
Nonword 1	1	796.269	15.62	.0003*
Error	40	2038.744		

*Significant at the p<.05 level.

Table 17

Summary of Analysis of Covariance for Decodable Nonword (2) Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	20.572	0.64	.4280
Nonword 2	1	1121.853	34.97	.0001*
Error	40	2477.906		

*Significant at the p<.05 level.

Table 18

Summary of Analysis of Covariance for Passage Reading Fluency Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	410.985	2.26	.1402
Fluency	1	35758.044	197.00	.0001*
Error	40	43030.279		

*Significant at the $p<.05$ level.

Table 19

Summary of Analysis of Covariance for Passage Reading Comprehension Task

Source of Variation	*df*	Sum of Squares	*F*	*p*
Group (experimental, comparison)	1	32.522	3.00	.0912
Comprehension	1	265.229	24.44	.0001*
Error	40	718.977		

*Significant at the $p<.05$ level.

This series of ANCOVAs yielded no significant effects by group for any of the dependent variables. Each covariate, with the exception of the segmentation measure, yielded significant results. Because the results for several of the dependent variables by group approached significance, further analysis was warranted.

To allow further examination of the performance of each of the groups, Pearson Correlation Coefficients were obtained for the pretest and posttest results from each of the primary dependent measures: phonological awareness total, reading fluency, and reading comprehension. Correlations by treatment group were calculated for each dependent measure to illustrate the relationships. Correlation coefficients for the experimental and comparison groups yielded several significant relationships. The correlation matrix for the experimental group is reported in Table 20. The correlation matrix for the comparison group is reported in Table 21.

Table 20

Correlation Matrix for the Experimental Group

	fluency pre	comp pre	PA total pre	fluency post	comp post	PA total post
fluency pre	1.00000 0.0	0.62937 0.0017	0.41258 0.0564	0.86463 0.0001	0.71452 0.0002	0.30528 0.1671
comp pre		1.00000 0.0	0.26539 0.2326	0.76427 0.0001	0.74259 0.0001	-0.1258 0.5768
PA total pre			1.00000 0.0	0.35515 0.1048	0.43203 0.0447	0.50949 0.0154
fluency post				1.00000 0.0	0.90374 0.0001	0.23630 0.2897
comp post					1.00000 0.0	0.26103 0.2407
PA total post						1.00000 0.0

Note. Correlations >.42 are significant at the .05 level.

The significant correlations between the fluency pretest and the other variables for both groups were notable. For example, the relationship between the fluency pretest and the comprehension posttest for the experimental group was of particular interest ($r = 0.71452$, $p = 0.0002$). These results prompted additional analyses of the data. The results of these analyses are reported in the following section.

Table 21

Correlation Matrix for the Comparison Group

	fluency pre	comp pre	PA total pre	fluency post	comp post	PA total post
fluency pre	1.00000 0.0	0.58223 0.0056	0.35885 0.1102	0.95275 0.0001	0.55727 0.0087	0.38420 0.0855
comp pre		1.00000 0.0	0.24113 0.2923	0.52838 0.0138	0.47640 0.0290	0.27063 0.2354
PA total pre			1.00000 0.0	0.29678 0.1914	0.27801 0.2224	0.58867 0.0050
fluency post				1.00000 0.0	0.64952 0.0014	0.46068 0.0356
comp post					1.00000 0.0	0.66645 0.0010
PA total post						1.00000 0.0

Note. Correlations >.42 are significant at the .05 level.

Related Findings

Because the extreme variance on several of the dependent measures appeared to contribute to a loss of statistical power, methods of reducing the variance and, hence, restoring statistical power were sought. Because there was a significant relationship between scores on the reading fluency pretest and several of the other dependent measures, the reading fluency data were inspected further. Examination of the raw data and of the means and standard deviations of pretest scores revealed particularly extreme differences among subjects on pretest measures of reading fluency. The pretest range on the fluency test was from 0 to 130 words read correctly in one minute.

Because the fundamental aim of this study was to attempt to identify potential methods for increasing the reading skills of poor readers, further analysis of the data was warranted. The two groups were divided into two levels based on reading fluency pretest scores. Those subjects in each group who read 15 or fewer words correctly on the reading fluency pretest were assigned to level one. Those subjects in each group who read more than 15 words correctly on the reading fluency pretest were assigned to level two.

Further analyses were conducted to determine if entering level of reading fluency influenced the outcomes of the two treatments. The two groups were first compared by level to confirm that the divided groups were equivalent on the pretests. A summary of the pretest comparison is provided in Table 22.

The pretest comparison of the groups by level revealed a significant difference between the groups in level one on the pretest measure of sound matching, [$t(19) = -2.1140$, $p = .0480$]. Further analyses were conducted to ensure that a comparison of the two groups in level one on the sound

Table 22

Comparison of Level One Pretest Scores by Group

	Experimental Group (n=11)		Comparison Group (n=10)				
Variable	Mean	SD	Mean	SD	*t*	df	*p*
PA total	30.9	7.4	32.5	9.6	.4286	19	.6731
elision	8.8	2.7	7.8	2.2	.9381	19	.3600
sound match	7.2	2.2	9.9	3.6	2.1140	19	.0480*
blending	10.2	2.0	10.6	2.6	.4130	19	.6842
segment	4.7	2.6	4.2	4.0	.3598	19	.7230
word 1	6.0	4.7	6.9	7.0	.3482	19	.7315
word 2	5.8	4.0	5.4	5.8	.1945	19	.8478
nonword 1	4.2	4.8	5.1	4.3	.4612	19	.6499
nonword 2	3.3	4.2	3.5	4.1	.1243	19	.9024
fluency	7.9	5.0	9.1	4.2	.5869	19	.5642
comprehension	1.5	1.6	2.8	1.9	1.6388	19	.1177

Note. Level one students scored ≤ 15 on fluency pretest.

Table 23

Comparison of Level Two Pretest Scores by Group

	Experimental Group (n=11)		Comparison Group (n=11)				
Variable	Mean	SD	Mean	SD	*t*	df	*p*
PA total	41.2	8.9	40.5	8.9	.1911	20	.8503
elision	11.4	2.0	9.5	3.0	1.6903	20	.1065
sound match	11.9	4.1	13.1	3.6	.7207	20	.4795
blending	11.1	2.8	11.3	2.6	.1562	20	.8775
segment	6.8	2.2	6.5	3.7	.2118	20	.8344
word 1	17.0	5.9	17.4	12.3	.0887	14.4	.9305
word 2	15.5	5.9	19.7	18.1	.7462	12.1	.4699
nonword 1	8.3	4.3	9.9	5.5	.7825	20	.4431
nonword 2	6.9	4.3	8.7	5.2	.8900	20	.3841
fluency	36.0	21.1	42.3	35.4	.5050	20	.6191
comprehension	5.3	3.4	4.8	2.7	.3497	20	.7302

Note. Level two students scored > 15 on fluency pretest.

matching variable would be valid. A repeated measures analysis of variance (ANOVA) was conducted to examine the differences between the groups by level on the sound matching measure. This analysis indicated that the level by group interaction was not significant [*F*(1,39) = .54, *p* = .4683]. Because the interaction was not significant, comparison of the groups by level on the sound matching variable would be valid.

The reduction in sample size resulting from the division of the groups into levels negated the use of ANCOVA to compare the groups by level with pretest as the covariate. Instead, the gain scores of the two groups by level were compared using *t* tests. Tables 24 and 25 provide a summary of the analysis of gain scores by level and group.

Table 24

Analysis of Level One Gain Scores by Group

	Experimental Group		Comparison Group				
Variable	Mean	SD	Mean	SD	*t*	df	*p*
PA total	23.1	7.9	13.4	13.6	2.0153	19	.0528*
elision	2.7	2.8	1.3	3.4	1.0664	19	.2996
sound match	4.5	3.9	0.5	5.6	1.8739	19	.0764
blending	8.7	3.7	6.1	3.9	1.5803	19	.1305
segment	7.2	3.3	5.5	5.0	.9206	19	.3688
word 1	3.0	3.8	3.7	4.3	.3915	19	.6998
word 2	4.6	6.1	6.6	5.7	.7597	19	.4568
nonword 1	1.4	4.0	2.1	4.8	.3843	19	.7050
nonword 2	1.7	4.0	2.1	3.8	.2165	19	.8309
fluency	15.0	14.5	12.0	9.2	.5684	19	.5843
comprehension	3.5	2.9	0.9	2.8	2.0492	19	.0545*

*Significant at the *p*<.05 level.

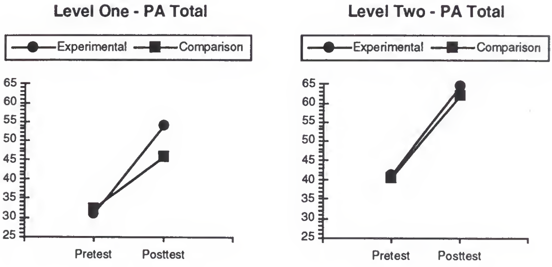
These additional analyses revealed that those subjects in the experimental group who scored at or below 15 on the pretest measure of reading fluency (level one) experienced significantly higher gains on the measures of phonological awareness [$t(19) = 2.0153$, $p = .0528$] and reading comprehension [$t(19) = 2.0492$, $p = .0545$] than subjects in the comparison group who scored at or below 15 on the pretest of reading fluency. No significant differences between the groups were found on any of the dependent measures for subjects who read more than 15 words correctly on the reading fluency pretest (level two).

Table 25

Analysis of Level Two Gain Scores by Group

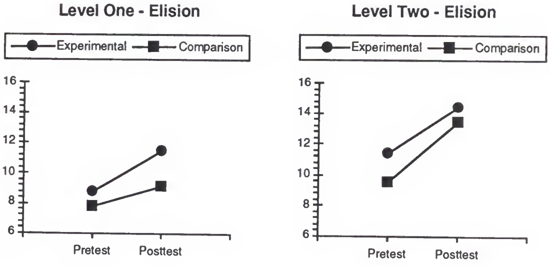
	Experimental Group		Comparison Group				
Variable	Mean	SD	Mean	SD	t	df	p
PA total	23.5	14.7	21.6	9.0	.3482	20	.7313
elision	3.0	3.5	3.9	3.0	.6534	20	.5209
sound match	3.3	3.2	2.4	3.9	.5974	20	.5572
blending	10.6	5.3	8.8	3.5	.9532	20	.3518
segment	6.5	5.3	6.5	4.6	.0000	20	1.0000
word 1	12.6	6.7	10.8	6.7	.6349	20	.5327
word 2	11.9	5.7	5.2	11.5	1.7409	14.6	.1028
nonword 1	4.8	6.4	5.9	10.7	.2902	20	.7747
nonword 2	5.5	5.6	7.7	6.6	.8710	20	.3941
fluency	27.0	16.1	18.5	11.5	1.4174	20	.1718
comprehension	5.0	2.2	3.8	4.2	.8252	20	.4190

A graphic illustration of these data is provided in Figure 1. Each graph depicts pretest and posttest performance means on one dependent measure for one level of subjects. The graphs illustrate the differences in gains between the experimental and comparison groups on each measure.


Level One - PA Total

Level Two - PA Total

Figure 1. Pretest to posttest gains in total phonological awareness for levels one and two of both groups.


Level One - Elision

Level Two - Elision

Figure 2. Pretest to posttest gains in elision for levels one and two of both groups.

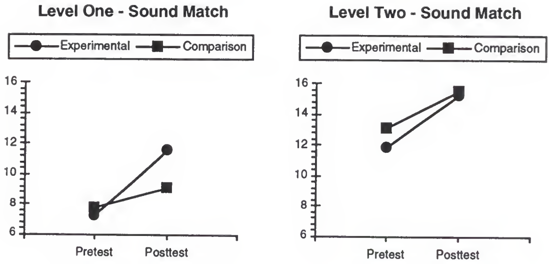


Figure 3. Pretest to posttest gains in sound matching for levels one and two of both groups.

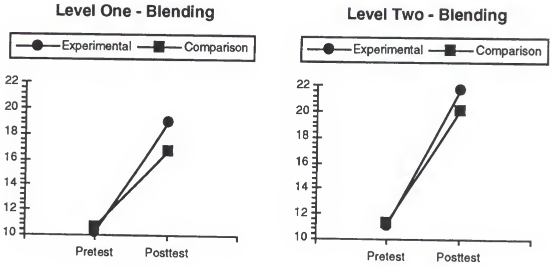
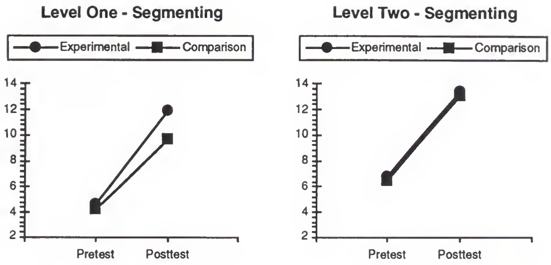


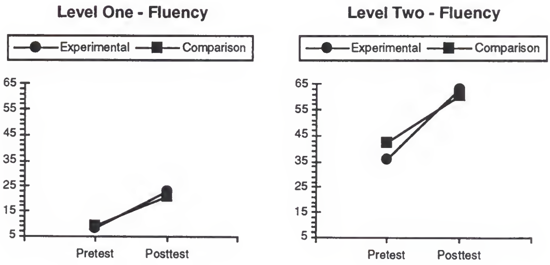
Figure 4. Pretest to posttest gains in blending for levels one and two of both groups.



Level One - Segmenting

Level Two - Segmenting

Figure 5. Pretest to posttest gains in segmenting for levels one and two of both groups.



Level One - Fluency

Level Two - Fluency

Figure 6. Pretest to posttest gains in fluency for levels one and two of both groups.

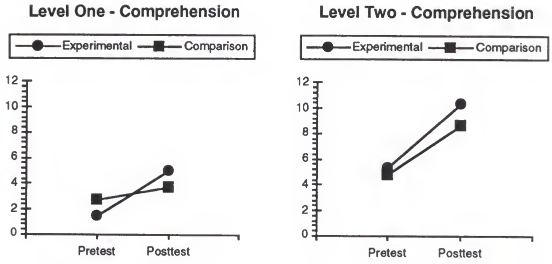


Figure 7. Pretest to posttest gains in reading comprehension for levels one and two of both groups.

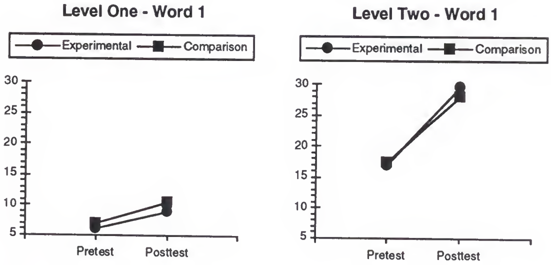


Figure 8. Pretest to posttest gains in decodable word reading (word 1) for levels one and two of both groups.

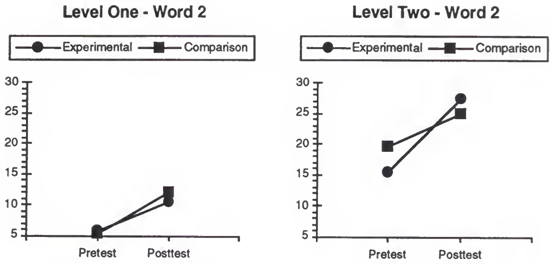


Figure 9. Pretest to posttest gains in decodable word reading (word 2) for levels one and two of both groups.

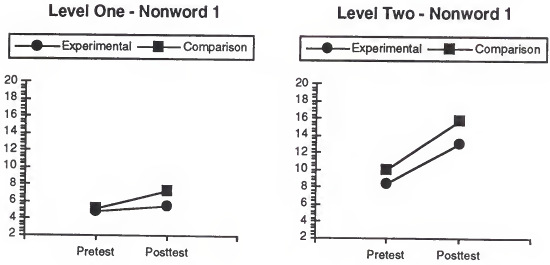
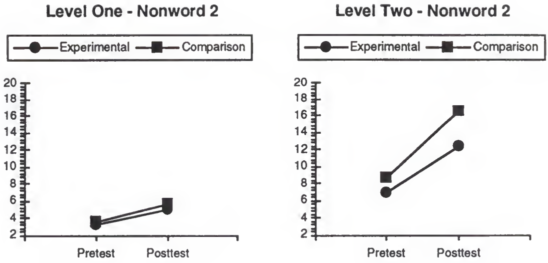


Figure 10. Pretest to posttest gains in decodable nonword reading (nonword 1) for levels one and two of both groups.


Level One - Nonword 2

Level Two - Nonword 2

Figure 11. Pretest to posttest gains in decodable nonword reading (nonword 2) for levels one and two of both groups.

Social Validation Measures

In addition to the analysis of data from the pretest and posttest measures, the social validity of the phonological awareness instruction was measured through questionnaires from teachers and interviews with subjects. This section includes a summary of the social validity data.

Teacher Questionnaires

Because the instructional procedures used in this study were designed to be used as a part of regular classroom reading instruction, the regular classroom teachers of the subjects in the study were asked to provide their perceptions of the procedures.

Each teacher was requested to complete a questionnaire about her own reading program and her perceptions about the phonological awareness instruction. Of the nine teachers with students participating in the study, three teachers completed and returned the questionnaire within the allotted time. A summary of the teachers' responses is provide in Table 26.

Table 26

Responses to Teacher Questionnaire

Noticed improvements in the following reading skills:	Teacher 1	Teacher 2	Teacher 3
sight word knowledge			√
letter-sound knowledge	√		√
decoding skills	√	√	√
reading fluency		√	
writing skills	√		
spelling skills	√	√	√
reading comprehension		√	

Each of the three teachers reported that they had noticed improvements for the students who participated in the intervention that they attributed to the students' participation. All three teachers reported improvements in decoding and spelling. One of the teachers also noticed an improvement in reading comprehension and reading fluency. Another reported an improvement in writing skills. Two teachers noticed improvements in letter-sound knowledge. The three respondents noted that, overall, they believed the intervention was beneficial to the students involved.

Student Interviews

Within one week following the posttest phase of the study, eight of the subjects were interviewed regarding their perceptions of the phonological awareness instruction. The subjects who were interviewed were randomly selected from the participants at two of the three schools.

The subjects were asked two open-ended questions: "What did you think of the activities that you did with the robot?" and "Will you use anything from those activities again?" A summary of the subjects' responses to these questions is presented in Table 27.

Summary

The purpose of this study was to determine the effects of explicit instruction in the contextual application of phonological awareness on word and nonword reading, reading fluency, and reading comprehension, and on the development of phonological awareness. Also of interest were the students' and teachers' perceptions of the intervention.

Interscorer agreement was calculated on each measure. In addition, procedural reliability was examined to ensure integrity of treatment conditions. Interscorer agreement on the screening instrument was 98%. Interscorer agreement on the pretests was 96%, while agreement on the posttests was 100%. In addition, procedural fidelity was 100%.

Table 27

Responses to Subject Interviews

Subject	Question 1: What did you think of the activities that you did with the robot?
1	He was cool! I liked those games.
2	When do we get to do some more of that?
3	It was O.K. I liked those girls that worked with us .
4	The robot was fun. I learned how to spell and write.
5	Do you mean R-o-bb-ie? (spoke in segmented sounds)
6	I liked it. The stickers were the best part.
7	That was fun. Why did we stop?
8	It was great. The robot was funny.

Subject	Question 2: Will you use anything from those activities again?
1	I think so. (Researcher: How?) I don't know.
2	I use it in reading and spelling and math. (Researcher: How do you use it in math?) When I come to one of those word problems.
3	I'll use it when I have to write something.
4	Whenever I write, I think about that and it helps me spell.
5	M-y m-o-m l-i-ke-s i-t, t-oo.
6	Yes. (Researcher: How?) In reading.
7	Yes, all the time. I use it in reading and stuff.
8	I already do. It helps me read better.

A series of ANCOVAs was used to test the null hypotheses of no difference in phonological awareness, fluency, comprehension, word reading, or nonword reading. No significant differences between experimental and comparison conditions were detected resulting in a failure to reject the null hypotheses.

Follow-up analyses were conducted to detect any other differences between the groups. When the groups were divided into levels according to reading fluency pretest scores, significant differences between the experimental and comparison groups were detected on measures of reading comprehension and total phonological awareness for those subjects with very low reading fluency on the pretest. In addition, correlation coefficients for the experimental and comparison groups yielded significant relationships between several of the dependent variables.

Finally, measures of social validity of the treatments yielded positive responses from both teachers and students. These responses indicated overall satisfaction with the phonological awareness instruction. Both teachers and students noted specific ways in which the intervention was beneficial.

CHAPTER V
DISCUSSION

A discussion of the findings and implications in the investigation of the effects of explicit instruction in contextual application of phonological awareness skills is presented in this chapter. The chapter begins with a summary of the hypotheses and results. The subsequent sections contain a discussion of the theoretical implications of the research findings, the limitations of the study, and suggestions for future research.

Summary of the Hypotheses and Results

The general question of the study was as follows: Does explicit instruction in the application of phonological awareness skills in the context they are used affect the acquisition and use of the skills? The following null hypotheses were posited for testing at the .05 level of confidence:

H_1: There will be no statistically significant difference between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application on measures of phonological awareness, including elision, sound matching, blending, and segmentation.

No significant difference was indicated between the experimental and comparison groups on measures of phonological awareness, resulting in a failure to reject the null hypothesis. When the groups were divided into levels according to pretest reading fluency scores, a significant difference between treatments was detected. Subjects with very low pretest scores in fluency who received instruction in contextual application of phonological skills made greater gains in the development of phonological awareness than similar subjects in the comparison group.

H_2: There will be no statistically significant difference between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application on measures of passage reading fluency.

No significant difference was indicated between the experimental and comparison groups on measures of passage reading fluency, resulting in a failure to reject the null hypothesis.

H_3: There will be no statistically significant difference between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application on measures of reading comprehension.

No significant difference was indicated between the experimental and comparison groups on measures of reading comprehension, resulting in a failure to reject the null hypothesis. However, subjects with very low pretest scores in fluency who received instruction in contextual application of phonological skills made greater gains in reading comprehension than similar subjects in the comparison group.

H_4: There will be no statistically significant difference between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application on measures of decodable word recognition.

No significant difference was indicated between the experimental and comparison groups on measures of decodable word recognition, resulting in a failure to reject the null hypothesis.

H_5: There will be no statistically significant difference between the subjects who receive phonological awareness instruction with a contextual application component and those who receive phonological awareness instruction without contextual application on measures of decodable nonword recognition.

No significant difference was indicated between the experimental and comparison groups on measures of decodable nonword recognition, resulting in a failure to reject the null hypothesis.

Theoretical Implications of the Research Findings

Connectionist theory was applied in this study through the design and implementation of the phonological awareness instruction. The instruction included an attempt to strengthen associations between phonological awareness skills and the decoding involved in reading connected text. Operating within the connectionist framework, instruction in phonological awareness that included explicit instruction in contextual application of skills was compared with instruction that lacked the contextual application component.

Initial analysis of the data revealed significant gains on all dependent measures by both groups. These findings are consistent with the results of previous research (Ball & Blachman, 1991; Blachman, 1991; Foorman et al., 1991; Haskell, Foorman, & Swank, 1992; Lundberg, Frost, & Petersen, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993; Olson, Kliegl, Davidson, & Foltz, 1985; Torgesen & Morgan, 1990; Torgesen, Morgan, & Davis, 1992; Tunmer & Nesdale, 1985) that has shown that instruction in phonological awareness increases phonological skills and reading skills.

The initial analysis also revealed no significant differences between the experimental and comparison groups on any of the dependent measures. One possible explanation for the lack of treatment differences is the amount and type of reading instruction previously received by the subjects. Previous instruction that included the contextual application of phonological skills would have negated differences between the treatment groups. Despite greater mean gains for the experimental group on nearly every dependent measure, the sample size may have been too small to allow analyses the sensitivity to detect statistically significant differences. In addition, the length of the intervention (18 sessions) may have been too short to develop the phonological awareness and reading skills enough to reveal differences between treatments. As Blachman (1994) and Torgesen, Wagner, and Rashotte (1994) emphasized, more longitudinal research is needed that focuses on best combination of instructional components for the development of phonological awareness. The minimal duration of most training studies allows few reliable conclusions about the role of various components of phonological awareness instruction in the development of generalizable skills.

Further analysis of the data demonstrated differences between the gains in phonological awareness and reading comprehension made by subjects with low reading fluency scores. Those subjects with low reading fluency benefited from the contextual application component of the instruction.

These results imply that contextual application of phonological skills may not be an essential component of instruction with all first-grade students. For those first-grade students who could be considered nonreaders (i.e., students with extremely low levels of oral reading fluency) contextual application appears to be an important component of phonological awareness instruction. Torgesen, Wagner, and

Rashotte (1994) expressed concern that improving the phonological awareness of children who are considered to be at risk for reading failure is especially difficult. In the present study, the significantly greater gains in phonological awareness and reading comprehension for subjects with very low reading fluency (i.e., subjects who could be considered at risk for reading failure) who received instruction in context indicate that contextual application of phonological skills during instruction may be a powerful tool for achieving difficult instructional goals.

Connectionist theory promotes the use of context in instruction as a method of strengthening associations (Adams, 1990; Goldsmith-Phillips, 1989; Lee & Gasser, 1992; Rumelhart, 1989). Contextual application during phonological awareness instruction does not, however, appear to be essential for all students to develop phonological skills, or to improve word and nonword reading, reading fluency, or reading comprehension during phonological awareness instruction. Conversely, contextual application during phonological awareness instruction does appear to benefit very poor readers. Without detailed information about the previous formal and informal reading instruction received by the subjects in this study, it is impossible to determine if or how much prior knowledge about the contextual application of reading-related skills influences the need for instruction in context.

According to Rumelhart (1989), associations are strengthened through repeated activation. Rumelhart also explained that new associations that are similar to previous associations are more easily formed than novel associations. With consideration of Rumelhart's assertions, if subjects had received a significant amount of successful context-based instruction in reading-related skills, they may have already formed the association between reading-related skills and contextual applications of those skills. These previous associations may have facilitated the formation of new associations between phonological skills and their contextual applications, even without explicit instruction.

That contextual application of phonological skills during instruction may facilitate the acquisition and generalization of these skills for poor readers supports the assertions of Rumelhart (1989), as well. Explicit instruction in the contextual applications of phonological skills may be necessary to develop novel associations for poor readers. Because poor readers spend less time reading than skilled readers (Adams, 1990), they are less likely to have had the repeated associations that Rumelhart described. Poor readers may depend more on explicit instruction to develop these associations.

The inference that instruction in context is especially beneficial to poor readers is also consistent with the conclusions of Stokes and Baer (1977). Stokes and Baer averred that students who are especially weak in a skill acquire and generalize the skill more efficiently when instruction mediates generalization. Instruction that includes contextual application of the skill may function as a mediation of generalization.

The implications for special education are clear. Contextual application of skills is an important issue to consider for teachers of students with very low skill levels. In the case of phonological skills illustrated in this study, contextual application during instruction facilitated the development of skills (i.e., increased phonological awareness) and the generalization of skills (i.e., increased reading comprehension).

Limitations to the Present Study

This study had several limitations. The most powerful limitation was time. Eighteen sessions of phonological awareness instruction generated significant gains for both groups on all dependent measures. The mean gain scores of the experimental group were higher, although not statistically significant, on every dependent measure except nonword reading. Additional instructional sessions may have served to strengthen further the associations for the experimental group and increase the differences in the gain scores.

A second limitation of this study is the grade level of the subjects. Only students in the first grade participated in the instruction. The results of this study may not be generalized to older or younger students without systematic replication of the procedures with those populations.

Another limitation of this study is the entering level of phonological awareness and reading ability of the subjects. All of the subjects had low levels of phonological awareness at the outset of the study. Most of the subjects also had poor reading skills. The results of this study may not be generalized to students with average or above average levels of phonological awareness or to populations of students with average or above average reading skills. The subjects in this study had received approximately 6 months of formal reading instruction before the beginning of the phonological awareness instruction. The results may have been different for students with more or less prior experience in reading instruction.

All of the instructional sessions in this study took place outside of the regular classroom. The sessions were conducted by instructors other than the students' regular classroom teacher. The results might have been different for instruction that occurred within the regular classroom and that was delivered by the students' regular teacher.

Suggestions for Future Research

Classroom instruction in phonological awareness would surely continue beyond the time constraints of this study. Additional research is warranted in which the longitudinal effects of contextual applications of phonological skills are examined. The long-term effects of contextual application of phonological skills on the development of those skills for poor readers deserves further attention.

Because phonological awareness instruction is becoming a recognized part of beginning reading instruction, additional research with older and younger students is warranted. Additional research could determine the effects of contextual application of phonological skills with kindergarten students and second and third grade students.

Summary

This study was conducted to examine the effects of contextual applications of phonological skills as part of phonological awareness instruction. Results indicated that all students made significant gains on each dependent measure following phonological awareness instruction. Results also indicated that, for most students, instruction and practice in context did not effect significantly different gains from instruction without the contextual application component. Further analysis, however, indicated that students with very low reading fluency experienced significantly greater gains in development of phonological awareness and in reading comprehension when their phonological awareness instruction included application of skills in context.

These findings hold several implications for reading instruction and for reading research. Teachers should understand that phonological awareness instruction is helpful for developing the skills of beginning readers. Teachers should also understand that instruction that includes practice of reading skills in a meaningful context may be beneficial to their students, especially those students with very weak skills. Researchers should consider the implications of connectionist theory in beginning reading research. The strengthening of associations between phonological awareness instruction and the context in which the skills are applied may be an important area of research for improving beginning reading instruction. That such instruction may be especially useful for improving the skills of very poor readers should interest educators and researchers alike.

APPENDIX A

PARENTAL INFORMED CONSENT DOCUMENT

Parental Informed Consent Document

Dear Parent:

I am a graduate student in the Department of Special Education at the University of Florida. As part of my dissertation research, I need to gather information on a reading skill instructional technique for phonological awareness. Phonological awareness, or the sensitivity to or awareness of the sound structure of language, has been shown to be closely linked with reading ability. Students who receive training in phonological awareness tend to have gains in reading, especially in their ability to sound out words. Your child has qualified for participation in this training based on his/her current level of phonological awareness.

The training sessions for the study will take place during two to three mornings each week. The sessions will be scheduled during the students' regular reading time and will not interfere with other regular instruction. Each session will last for approximately 15-20 minutes. Training will last for approximately six to eight weeks beginning in March and continuing through April. The trainers will be students from the College of Education at the University of Florida. During the training sessions, students will work with the trainers in groups of three to five. Students in the phonological awareness group will work on blending, segmenting, and rhyming tasks and will practice reading short passages. Students in the control group will work on reading comprehension skills that are not directly related to phonological awareness.

The following instruments will be administered during the training period:

1. The Peabody is a short measure of verbal ability or vocabulary knowledge in which the child is presented with a series of picture sets and is asked to identify which picture in each set goes best with a given word.

2. A portion of the Qualitative Reading Inventory will measure passage reading fluency and reading comprehension.

3. Several short measures of word recognition and phonological awareness. In these activities, the child will be asked to read words, blend sounds together to form a word, separate the sounds in a word, or detect which words in a series rhyme.

We hope that participation in this training will benefit your child by increasing his/her phonological awareness and, therefore, his/her ability to sound out words while reading. There are no risks associated with this type of training.

Participation in this study will not affect your child's grade in any way. No compensation will be awarded other than stickers on a progress chart, which students will be allowed to keep at the conclusion of the training. You, as parent or guardian, and your child have the right to withdraw permission for the child's participation at any time during the study, without penalty or prejudice.

If you allow your child to participate in this study, please discuss with him/her that researchers from UF will be coming to his/her school and that it is okay to work with us.

If you have any questions regarding any portion of this study, please feel free to contact me at 392-0701, extension 262. Thank you for your consideration.

Sincerely,

Holly Lane, M. Ed.

✂ Clip and retain this portion for future reference.

Return this portion to your child's teacher immediately.

I have read and I understand the procedure described above. I agree to allow my child, _________________________ , to participate in Holly Lane's Phonological Awareness study and I have received a copy of the description.

__________________________ ___________

Parent/Guardian Signature Date

__________________________ ___________

Second Parent/Witness Date

APPENDIX B

SCREENING INSTRUMENT:
TEST OF INVENTED SPELLING

Screening Instrument - Invented Spelling Test

Part 1: Words

Let students know that the purpose of this test is to see how well they can sound out words. The idea is for them to listen to the sounds in the words and spell them like they sound. To administer the test, say each word then read the sentence and, finally, repeat the word. Allow students sufficient time to sound out each word carefully. Do NOT sound out words *for* students. Spellings will be scored for phonological accuracy.

1.	lady	The old lady smiled when we arrived.	lady
2.	pretend	We can pretend we are old.	pretend
3.	flame	The flame of the candle lit the room.	flame
4.	float	The canoe will float down the river.	float
5.	while	Whistle while you work.	while
6.	cost	Does this apple cost fifty cents?	cost
7.	finish	Derek helped me finish my work.	finish
8.	angry	Mother was angry when we were late.	angry
9.	people	Five people visited our store.	people
10.	mailed	I mailed the letter last week.	mailed
11.	reach	I couldn't reach the top shelf.	reach
12.	step	Watch your step!	step
13.	junk	I cleaned the junk out of my closet.	junk
14.	planted	We planted a tree in the yard.	planted
15.	dress	Annie wore a new blue dress.	dress
16.	lasted	The game lasted until five o'clock.	lasted
17.	picking	The children were picking flowers.	picking
18.	ruler	We used a ruler to measure the paper.	ruler
19.	peeked	Calvin peeked around the corner.	peeked
20.	scream	James can scream louder than Eric.	scream

Part 2: Nonwords

Let students know that the purpose of this test is to see how well they can sound out silly words. Each nonword follows conventional spelling rules. The idea is for the students to listen to the sounds in the nonwords and to spell them like they sound. To administer the test, say each nonword three times. A guide for pronunciation follows each nonword. Allow students sufficient time to sound out each nonword carefully. Spellings will be scored for phonological accuracy.

1.	rame	(rhymes with *game*)
2.	kess	(rhymes with *mess*)
3.	boke	(rhymes with *broke*)
4.	meef	(rhymes with *beef*)
5.	fid	(rhymes with *lid*)
6.	gluff	(rhymes with *buff*)
7.	hap	(rhymes with *map*)
8.	sube	(rhymes with *tube*)
9.	dob	(rhymes with *rob*)
10.	mibe	(rhymes with *bribe*)
11.	neepy	(rhymes with *sleepy*)
12.	plock	(rhymes with *rock*)
13.	strake	(rhymes with *rake*)
14.	brump	(rhymes with *dump*)
15.	higging	(rhymes with *digging*)
16.	jasted	(rhymes with *blasted*)
17.	tesser	(rhymes with *dresser*)
18.	cridle	(rhymes with *bridle*)
19.	ploning	(rhymes with *cloning*)
20.	studge	(rhymes with *fudge*)

APPENDIX C

PHONOLOGICAL AWARENESS MEASURES

ELISION

PRACTICE: Let's play a word game. Say TOOTHBRUSH. Now say TOOTHBRUSH without saying TOOTH.

If correct: That's right. Let's try the next one.

If incorrect: That's not quite right. TOOTHBRUSH without saying TOOTH is BRUSH.

CEILING: 5 errors in a row.

PRACTICE ITEMS (continue to give correct/incorrect feedback as above):

Let's try some more.	Correct response:	(+/-)
a. Say TULIP. Now say without saying LIP.	TO	___
b. Say CUP. Now say CUP without saying the /k/ sound.	UP	___
c. Say MEET. Now say MEET without saying the /t/ sound.	ME	___
d. Say POUCH. Now say POUCH without saying the /p/ sound.	OUCH	___

TEST ITEMS (no more feedback given):

1. Say COWBOY. Now say COWBOY without saying BOY.	COW	___
2. Say APPLESAUCE. Now say APPLESAUCE without saying SAUCE.	APPLE	___
3. Say BASEBALL. Now say BASEBALL without saying BASE.	BALL	___
4. Say WINDOW. Now say WINDOW without saying DOW.	WIN	___
5. Say CARD. Now say CARD without saying the /d/ sound.	CAR	___
6. Say HEAT. Now say HEAT without saying the /t/ sound.	HE	___
7. Say NO. Now say NO without saying the /n/ sound.	OH	___
8. Say BE. Now say BE without saying the /b/ sound.	EE	___
9. Say BAT. Now say BAT without saying the /b/ sound.	AT	___
10. Say MAN. Now say MAN without saying the /m/ sound.	AN	___
11. Say GONE. Now say GONE without saying the /g/ sound.	ON	___

12. Say TIME. Now say TIME without saying the /m/ sound. TIE ___
13. Say SWING. Now say SWING without saying the /w/ sound. SING ___
14. Say STUN. Now say STUN without saying the /t/ sound. SUN ___
15. Say PRANCE. Now say PRANCE without saying the /r/ sound. PANTS ___
16. Say WINTER. Now say WINTER without saying the /t/ sound. WINNER ___
17. Say WALTER. Now say WALTER without saying the /l/ sound. WATER ___
18. Say RASKET. Now say RASKET without saying the /s/ sound. RACKET ___
19. Say TIGER. Now say TIGER without saying the /g/ sound. TIRE ___
20. Say STRAIN. Now say STRAIN without saying the /r/ sound. STAIN ___
21. Say DRIVER. Now say DRIVER without saying the /v/ sound. DRYER ___
22. Say STABLE. Now say STABLE without saying the /s/ sound. TABLE ___
23. Say SILK. Now say SILK without saying the /l/ sound. SICK ___
24. Say SPLIDE. Now say SPLIDE without saying the /p/ sound. SLIDE ___
25. Say TWIKST. Now say TWIKST without saying the /k/ sound. TWIST ___

Score ________

SOUND MATCHING

PRACTICE: Let's play another word game. Say BAT. Now, which word *begins* with the same sound as BAT...BEAR or HIT? (emphasize the word *begins*)

If correct: That's right. BAT and BEAR begin with the same sound, /b/. Let's try the next one.

If incorrect: That's not quite right. The answer is BEAR because BAT and BEAR begin with the same sound, /b/. Let's try another next one.

CEILING: Stop when 4 out of 7 consecutive items are incorrect. Proceed to "ending sound" items.

PRACTICE ITEMS (continue to give correct/incorrect feedback as above):

	Correct response:	(+/-)
a. Which word begins with the same sound as CARD? CAKE, FARM, or HAD?		____
b. Which word begins with the same sound as GATE? BAT, CAGE, or GUN?		____
c. Which word begins with the same sound as LEG? RATE, LOOSE, or BIG?		____

TEST ITEMS (give no more feedback)

1. Which word begins with the same sound as PAN? PIG, HAT, or CONE?		____
2. Which word begins with the same sound as DUCK? RUSH, PICK, or DEEP?		____
3. Which word begins with the same sound as TIRE? PILE, CARE, or TAPE?		____
4. Which word begins with the same sound as FIT? FOOD, HAT, or SICK?		____
5. Which word begins with the same sound as CANE? PIN, COAT, or BAKE?		____
6. Which word begins with the same sound as RAIN? SAME, WIN, or RIP?		____
7. Which word begins with the same sound as LOVE? DIVE, LIMB, or RUB?		____
8. Which word begins with the same sound as BAG? BONE, DAD, or PIG?		____
9. Which word begins with the same sound as HOUSE? MICE, HAD, or FOUL?		____
10. Which word begins with the same sound as NAIL? MILL, NEED, or RAIN?		____

Score ________

PRACTICE: Let's change our word game. Say BAT. Now, which word *ends* with the same sound as BAT...BEAR or HIT? (emphasize the word *ends*)

If correct: That's right. BAT and HIT end with the same sound, /t/. Let's try the next one.

If incorrect: That's not quite right. The answer is HIT because BAT and HIT end with the same sound, /t/. Let's try another next one.

CEILING: Stop when 4 out of 7 consecutive test items are incorrect.

PRACTICE ITEMS (continue to give correct/incorrect feedback as above):

a.	Which word ends with the same sound as CARD? CAKE, FARM, or HAD?	HAD	___
b.	Which word ends with the same sound as GATE? BAT, CAGE, or GUN?	BAT	___
c.	Which word ends with the same sound as LEG? RATE, LOOSE, or BIG?	BIG	___

TEST ITEMS (give no more feedback)

1.	Which word ends with the same sound as ROB? HOT, RAIN, or TUB?	TUB	___
2.	Which word ends with the same sound as CAT? SIT, COMB, or PACK?	SIT	___
3.	Which word ends with the same sound as HEAD? PECK, HIKE, or SAD?	SAD	___
4.	Which word ends with the same sound as CANE? CAUSE, SUN, or TAIL?	SUN	___
5.	Which word ends with the same sound as BILL? PICK, BAT, or CALL?	CALL	___
6.	Which word ends with the same sound as PACK? KICK, BAT, or PILE?	KICK	___
7.	Which word ends with the same sound as DOG? DECK, LAWN, or WIG?	WIG	___
8.	Which word ends with the same sound as TAP? TOOK, DIP, or CAN?	DIP	___
9.	Which word ends with the same sound as SAVE? HAVE, FACE, or SIZE?	HAVE	___
10	Which word ends with the same sound as LEAF? LINE, HALF, or TEETH?	HALF	___

Score ______

Score from previous page ______

Total score ______

BLENDING

CEILING: Stop when child misses 5 items in a row.

NOTE: Say sounds at rate of 2 per second on all items. If the child asks you to repeat the sounds, you may do so.

PROMPT: If the child says the sounds separately (e.g., m-e, rather than me) prompt by saying, Try to say the sounds altogether as a real word. This prompt may be used as often as needed on practice items only.

DIRECTIONS: For this task, I'm going to say a word in small parts. I will say one part of the word at a time. I want you to listen carefully, then put the parts together to make a whole word. Ready? Let's try one.

What word do these sounds make? 'can-dy'

If correct: That's right. Let's try the next one.

If incorrect: That's not quite right. When you put 'can-dy' together, it makes 'candy'. Let's try the next one.

PRACTICE ITEMS (continue to give corrective feedback as above):

			Correct response:	(+/-)
a.	What word do these sounds make? hamm-er		hammer	___
b.	What word do these sounds make?	d-og	dog	___
c.	What word do these sounds make?	b-all	ball	___
d.	What word do these sounds make?	n-o	no	___
e.	What word do these sounds make?	m-a-n	man	___

DIRECTIONS: Let's try some more words. Each time, I will say a word one part at a time. Listen carefully and put the parts together to make a whole word.

TEST ITEMS (provide no more feedback)		Correct response:	(+/-)
1.	pen-cil	pencil	___
2.	num-ber	number	___
3.	happ-y	happy	___

4.	c-at	cat	____
5.	d-oll	doll	____
6.	t-oy	toy	____
7.	i-f	if	____
8.	b-ig	big	____
9.	sh-e	she	____
10.	s-aw	saw	____
11.	f-a-s-t	fast	____
12.	wh-i-ch	which	____
13.	j-u-m-p	jump	____
14.	w-a-sh	wash	____
15.	l-i-ke	like	____
16.	m-oo-n	moon	____
17.	c-o-l-d	cold	____
18.	d-i-ff-er-e-n-t	different	____
19.	c-ir-c-u-s	circus	____
20.	m-i-s-t-a-ke	mistake	____
21.	g-r-a-ss-h-o-pp-er	grasshopper	____
22.	a-l-m-o-s-t	almost	____
23.	s-o-me-b-o-d-y	somebody	____
24.	m-o-t-or-c-y-c-le	motorcycle	____
25.	b-a-m-b-oo	bamboo	____
26.	t-e-l-e-ph-o-n-e	telephone	____
27.	m-a-th-e-m-a-t-i-c-s	mathematics	____
28.	u-n-d-er-s-t-a-n-d	understand	____
29.	p-r-e-s-i-d-e-n-t	president	____

Score ________

SEGMENTING

CEILING: Stop when child misses 5 items in a row.

DIRECTIONS: I am going to say a word. I want you to break the word apart and say it sound by sound. Say each sound you hear in the order that you hear it. For example, if I say DAY, you would say it sound by sound, D-AY. Now you say the word DAY sound by sound.

If correct: That's right. You have the idea. Let's try the next one.

If incorrect: That's not quite right. To say DAY sound by sound, say D-AY. Let's try the next one.

PRACTICE ITEMS (continue corrective feedback)

Remember, I will say a word, then you say it sound by sound.

		Correct response:	(+/-)
a.	no	n-o	___
b.	it	i-t	___
c.	pie	p-i	___

Let's try a few more. I will say a word, then you say it sound by sound.

TEST ITEMS (no feedback)

1.	go	g-o	___
2.	do	d-oo	___
3.	me	m-e	___
4.	hi	h-eye	___
5.	up	u-p	___
6.	to	t-oo	___
7.	in	i-n	___
8.	ate	ay-t	___

Now we are going to do some words that have more sounds in them. Let's try a few for practice. (give corrective feedback as on previous practice items)

PRACTICE ITEMS

a.	man	m-a-n	___
b.	good	g-oo-d	___
c.	winner	w-i-nn-er	___

TEST ITEMS CONTINUED (no feedback)

9.	back	b-a-k	___
10.	got	g-o-t	___
11.	pig	p-i-g	___
12.	beast	b-ee-st	___
13.	won	w-o-n	___
14.	runner	r-u-nn-er	___
15.	jump	j-u-m-p	___
16.	cloth	c-l-o-th	___
17.	thunder	th-u-n-d-er	___
18.	person	p-er-s-o-n	___
19.	important	i-m-p-or-t-a-n-t	___
20.	neighborhood	n-ai-b-er-h-oo-d	___
21.	maqnify	m-a-q-n-i-f-eye	___
22.	pleasantly	p-l-e-z-e-n-t-l-ee	___
23.	naturally	n-a-ch-ur-a-l-ee	___
24.	straighten	s-t-r-ai-t-e-n	___
25.	occasionally	o-k-ai-zh-u-n-l-ee	___

Score ______

APPENDIX D

DECODABLE WORD AND NONWORD MEASURES

RECORDING FORM

Nonword 1 correct/incorrect ________

san	maf	fon	sut	sab	mot
fod	sut	lop	baf	hud	dob
huf	bot	rud	fop	raf	fot
rab	mon	han	mof	hun	suf
fod	maf	fon	sut	rab	mon
sut	bot	rud	fop	rof	hap
lop	hap	fod	rab	bot	rud
hud	sut	lop	baf	mon	han
dob	lop	baf	hud	dob	suf
san	maf	fon	lop	hap	mot

Nonword 2 correct/incorrect ________

rop	mib	hod	mof	het	bef
mot	sid	nep	baf	lib	heb
san	maf	fon	sut	sab	mot
fid	sut	lep	baf	hud	dob
hif	bot	rud	fep	raf	fot
rab	mib	han	mef	hun	suf
fod	maf	fon	sut	rab	mon
sut	fet	rud	fip	rof	hap
lep	hap	fid	rab	bot	rud
hud	seb	lop	bif	mon	han

RECORDING FORM

Word 1 correct/incorrect ________

sun	mad	fan	sat	sob	cup
fan	sat	lap	cot	hut	cat
hot	bat	rob	fun	rat	cop
rub	mud	had	mop	hot	bat
mad	sob	cup	lap	cot	hut
sun	fan	sat	rob	fun	cop
hot	bat	rub	mud	had	mop
mad	sob	cup	lap	cat	hut
fan	sat	lap	cut	hot	cat
hot	bat	rob	fun	rat	cop

Word 2 correct/incorrect ________

fun	map	fin	pet	sad	cap
ran	set	lip	cut	hat	sit
hot	bit	ran	fib	net	cop
red	mud	hid	mop	hit	bat
mad	sip	cup	sap	let	hut
sun	fan	sat	rib	fun	net
hit	bat	pit	mud	hat	mop
mad	met	cup	lap	fin	hit
fan	sat	lip	red	hot	cat
hot	bid	pet	fun	met	cop

sun	mad	fan	sat	sob	cup
fan	sat	lap	cot	hut	cat
hot	bat	rob	fun	rat	cop
rub	mud	had	mop	hot	bat
mad	sob	cup	lap	cot	hut
sun	fan	sat	rob	fun	cop
hot	bat	rub	mud	had	mop
mad	sob	cup	lap	cat	hut
fan	sat	lap	cut	hot	cat

fun	map	fin	pet	sad	cap
ran	set	lip	cut	hat	sit
hot	bit	ran	fib	net	cop
red	mud	hid	mop	hit	bat
mad	sip	cup	sap	let	hut
sun	fan	sat	rib	fun	net
hit	bat	pit	mud	hat	mop
mad	met	cup	lap	fin	hit
fan	sat	lip	red	hot	cat

fun	map	fin	pet	sad	cap
ran	set	lip	cut	hat	sit
hot	bit	ran	fib	net	cop
red	mud	hid	mop	hit	bat
mad	sip	cup	sap	let	hut
sun	fan	sat	rib	fun	net
hit	bat	pit	mud	hat	mop
mad	met	cup	lap	fin	hit
fan	sat	lip	red	hot	cat

rop	mib	hod	mof	het	bef
mot	sid	nep	baf	lib	heb
san	maf	fon	sut	sab	mot
fid	sut	lep	baf	hud	dob
hif	bot	rud	fep	raf	fot
rab	mib	han	mef	hun	suf
fod	maf	fon	sut	rab	mon
sut	fet	rud	fip	rof	hap
lep	hap	fid	rab	bot	rud

APPENDIX E

INTERVENTION SCRIPT
PRELIMINARY SESSIONS

Introduction

Two groups of students will participate in this study. Each group will meet in small instruction groups (3-5 students) throughout the intervention phase. Group A will receive phonological awareness instruction with a contextual application component. Group B will also receive phonological awareness instruction, but the instruction will not include any explicit instruction in contextual application of phonological skills.

For the first three sessions of the intervention, students in Groups A & B will receive identical instruction. The instructor will familiarize the subjects with phoneme detection and manipulation through modeling and guided practice. A picture of a robot will be used as an instructional aid to communicate the concepts of phoneme analysis and synthesis. The instructor will explain that Robbie the Robot can only say words or understand words when they are pronounced one sound at a time. The instructor will demonstrate a "conversation" with the robot in which words are first blended (interpreting the robot's words) and then segmented (speaking to the robot). The subjects will practice blending and segmenting words for the robot.

Throughout the first three sessions, the instructor should adhere as closely as possible to the script to ensure the integrity of the instructional procedures. In the script, the instructor’s portion of the dialogue is in bold.

Directions for the instructor's actions are in parentheses. The students' expected responses are in italics.

Script for Session #1

Instructor: (Advance Organizer) **Your teacher has probably already taught you a lot about sounds in reading. Today, you are going to learn how to work with the sounds in words in some special ways. You will learn how to put sounds together to make words. You will also learn how to take apart a word and say it sound by sound. Learning these things can help you become a better reader.**

Is everybody ready to learn some special things about sounds?

Students: *(affirmative response)*

Instructor: **Good! Let's get started.**
The first thing we need to do is meet a new friend who will be helping us to learn more about sounds. (show students the poster of Robbie the Robot) Everybody, say hello to Robbie the Robot!

Students: *Hello, Robbie!*

Instructor: (Look at Robbie as if you are waiting for a response and then realize your "mistake.") **Uh oh! I forgot to tell you something. Robbie can't understand us when we talk like we usually do.**

He can only say or understand words one sound at a time. If we want to say "Hello, Robbie," We must say it one sound at a time so that he can understand us.

Listen, I'll show you how. H-e-ll-o, R-o-bb-ie. (In a Robbie-the-Robot voice, respond) **H-e-ll-o!**

Now let's all say "Hello" to Robbie again, but this time let's say it sound by sound.

Instructor &
Students: ***H-e-ll-o, R-o-bb-ie!*** (prompt students who are having difficulty segmenting the sounds)

Instructor: (In a Robbie-the-Robot voice, respond) H-e-ll-o! **That was much better. That time Robbie understood what we were saying.**

Sometimes it's hard to tell where to break a word apart to say it sound by sound, but we will be getting much better at it in the next few days.

Now, Robbie will say some words to you. Remember that he will say the words sound by sound. I want you to tell me what words he says. Are you ready to listen very carefully?

Students: (*affirmative response*)

Instructor: **Good. Let's get started. Listen to the sounds Robbie says, then say the whole word.**

(Say each segmented word - across each row - in a Robbie voice and wait for students to blend the phonemes and to say the whole word. Provide praise and corrective feedback as needed. Be sure that each student says each word correctly before moving on to the next word.)

a-t	i-f	g-o	t-o	ou-t	o-n
s-u-n	f-a-n	v-e-t	m-o-p	s-a-t	r-o-b
m-a-d	f-u-n	b-a-t	r-a-p	c-u-p	m-u-d

Terrific job! You figured out every word that Robbie said. Now, let's say some words sound by sound so that Robbie can understand what we are saying. Are you ready to say some words sound by sound?

Students: (*affirmative response*)

Instructor: **Good! Let's get started. I'll tell you the word and you say it sound by sound so that Robbie can understand.**

(Say each word and direct students to say the word sound by sound. Provide praise and corrective feedback as needed. Ensure that each student is able to segment each word correctly before moving on to the next word. When you detect an error, use the model, lead, test, retest procedure.)

at if go do out on
sun fin met mop fat rob
mad fun sat rap cut pup

That was terrific! Robbie could understand every one of those words when you said them sound by sound.

Let's review what we've learned. I'll call on you one at a time to blend some sounds together to make a word. (Ask individual students to blend the following words.)

s-o r-u-n l-i-p s-a-t f-i-n m-u-d

Now, I'll call on you one at a time to say a word sound by sound. (Ask individual students to segment the following words.)

fan mop rat sip fat rub

Script for Session #2

Instructor: **Today, we are going to practice blending sounds together and taking them apart just like we did before. Remember that, when we speak to Robbie the Robot, we must say the words sound by sound. When Robbie speaks to us, he'll say the words sound by sound and we need to blend them together to get words that we can understand. We'll start by saying some of the same words that we said last time. Is everybody ready?**

Students: (*affirmative response*)

Instructor: **Good. Let's get started. Listen to the sounds that Robbie will say and tell me what words they make.**

(Say each segmented word in a Robbie voice and wait for students to blend the phonemes and to say the whole word. Provide praise and corrective feedback as needed. Use the model, lead, test, retest procedure as needed.)

a-t   i-f   g-o   t-o   ou-t   o-n
s-u-n   f-a-n   v-e-t   m-o-p   s-a-t   r-o-b
m-a-d   f-u-n   b-a-t   r-a-p   c-u-p   m-u-d
f-a-s-t   s-l-i-p   b-r-a-ke
l-a-m-p   c-o-s-t   d-e-s-k

Terrific job! You remembered how to figure out words that Robbie says. You even figured out some longer words. Now, let's practice saying some words sound by sound so that Robbie can understand what we are saying. Are you ready to say the words sound by sound?

Students: (*affirmative response*)

Instructor: **Good! Let's get started. Remember, I'll tell you the word and you say it sound by sound so that Robbie can understand.**

(Say each word and direct students to say the word sound by sound. Provide praise and corrective feedback as needed. Ensure that each student is able to segment each word correctly before moving on to the next word.)

at	if	go	do	out	on
sun	fin	met	mop	fat	rob
mad	fun	sat	rap	cut	pup
fast	slip	brake	lamp	cost	desk

That was terrific! Robbie could understand every one of those words when you said them sound by sound.

You're getting really good at saying words sound by sound and blending sounds together to make a word. Now we're going to practice using some even longer words. Do you think you can figure out some long words?

Students: (affirmative response)

Instructor: **Good. Let's get started. First Robbie will say some long words for you to figure out. Listen and blend the sounds together.**

(Say each segmented word in a Robbie voice and wait for students to blend the phonemes and to say the whole word. Provide praise and corrective feedback as needed.)

t-ea-ch-er	p-i-tch-er
h-o-pp-i-ng	m-ou-n-t-ai-n

Boy, that was tough work! It's hard to remember all of those sounds. The best way to remember is to blend the parts together as you go. I'll show you.

For example, when I heard Robbie say "t-ea-ch-er," I started blending sounds together in my head right away. He said "t-ea," and right away

in my head I said "tea." Then when Robbie said the "ch" sound, I added it to the "tea" in my head and I got "teach." When he said the "er' sound, it was easy for me to add it to "teach" to get "teacher".

Let's try some more long words and see if you can blend the sounds together in your head as we go. Listen.

p-o-ck-e-t

What word? (Wait for student responses.) **Did you blend the sounds together in your head? Did you say "po," and then "pock," and then "pocket?" Good! Let's try some more.**

d-i-n-o-s-au-r
m-ai-l-b-o-x
s-l-i-pp-er-y
s-t-o-p-w-a-tch

You're doing a terrific job blending sounds together. Now let's see if you can say some long words sound by sound so that Robbie can understand them. Listen.

(Say each word and direct students to say the word sound by sound. Provide praise and corrective feedback as needed. Ensure that each student is able to segment each word correctly before moving on to the next word.)

little
farmer
kitten
student
sleepy
animal

You've done a terrific job blending and taking apart some long words. Next time we'll be talking to Robbie and he'll be talking to us.

Script for Session #3

Instructor: **So far we have learned how to blend sounds together to make a word and how to break words apart and say them sound by sound. We blended and taken apart short words and long words. Today we are going to practice these new skills and use them to talk with Robbie the Robot.**

Let's begin by blending some of Robbie's sounds together to make words. Is everybody ready to blend sounds?

Students: (*affirmative response*)

Instructor: **Good. Let's get started. Listen to the sounds that Robbie says and tell me what words they make.**

(Say each segmented word in a Robbie voice and wait for students to blend the phonemes and to say the whole word. Provide praise and corrective feedback as needed. Use the model, lead, test, retest procedure as needed.)

a-t i-t g-o d-o ou-t o-n
f-u-n r-a-n m-e-t h-o-p s-a-t r-o-b
b-a-d d-u-ck c-a-t n-a-p c-u-p m-u-d
l-a-s-t f-l-i-p t-r-ai-n
d-a-m-p m-o-s-t r-e-s-t

Good job! Let's do some longer words. Remember to blend the sounds together in your head as Robbie says them.

r-a-d-i-o s-w-ea-t-er
f-i-n-i-sh t-e-l-e-ph-o-ne

Wow! You did a great job blending all those sounds together to make words. Did you remember to blend the sounds together in your head?

Students: (*affirmative response*)

Instructor: **Good! Now I will give each of you some words to say to Robbie sound by sound. Remember to break the words apart and say only one sound at a time.** (Say each word and direct individual students to say the word sound by sound. Provide praise and corrective feedback as needed.)

at if go do out on
sun fin met mop fat rob
mad fun sat rap cut pup
fast slip brake lamp cost desk

That was terrific! Robbie could understand every one of those words when you said them sound by sound.

Now I want you to talk with Robbie. You'll need to listen carefully to him and blend the sounds he says to make words. Remember that when you talk to him, you must say each word sound by sound so that he can understand you. Are you ready? Good.

(In a "Robbie" voice, ask each student questions, such as those below, saying each word sound by sound. Prompt students, if needed, to respond to Robbie by saying their words sound by sound.)

Wh-a-t i-s y-ou-r n-a-me?
H-ow o-l-d are y-ou?
D-o y-ou h-a-ve a-n-y b-r-o-th-er-s or s-i-s-t-er-s?
(etc.)

(Continue the sound-by-sound conversation for the remainder of the session.)

Wow! You have done a wonderful job talking with Robbie so that he could understand you. You have learned how to blend words and take words apart very well.

APPENDIX F

INTERVENTION SCRIPT
REGULAR SESSIONS

SESSIONS 4-13

Intervention A (Experimental Group)

General Directions: For each lesson, read the passage aloud to the group while you point to each word. Next, guide the group in reading the passage along with you two times (echo reading, then choral reading). Then ask the students to help you find words in the passage that have the target sound. Write each word they find on the paper. Practice the phonological awareness activities with each set of words. Finally, read the passage with the students one more time, slowing down to segment and blend those words with the target sound. Be certain to make *explicit the connection between the phonological awareness tasks and the passage reading.*

Script: **Today we are going to practice reading a passage and using some of the skills we have already learned. I want you to listen to me read and follow along with your eyes.** (Read passage and point to each word.)

This time, I'd like for you to read the passage along with me. First, look and listen while I read a sentence. Then you read the sentence with me. Everybody ready? (Read the passage again, still pointing to each word. Read each sentence twice, once as a model then once as the students read with you - echo reading.)

That was terrific! Let's read it one more time, this time let's all read together. Ready? (Read the passage a third time with students reading along throughout the passage - choral reading.)

Good reading! Now I'd like for you to help me look at the words in this passage. Help me find all the words that have a (say target sound) **in them. I'll write down each word that we find.** (Assist students in finding all words with the target sound and write them down.)

Great! Now, let's practice saying these words with Robbie. Robbie will say a word and you see if you can figure out what word he says. (Say each of the words sound by sound in a Robbie-the Robot voice as students blend the sounds to say the word.)

Now you get to say the words sound by sound so that Robbie can understand them. (Guide the group in saying each word sound by sound. Then ask individual students to practice segmenting each word.)

That was good! Now we are going to read our passage one more time. This time, when we come to one of the words with the (say target sound) **sound, we'll say it sound by sound and then say the whole word.** (Read the passage with the students. At each word with the target sound, stop and guide the students in saying the word sound by sound and blended. Do not spend time correcting students' errors during the passage reading. Let your reading serve as a model.)

Good reading! Remember, when you are reading, that you can say a word sound by sound to figure out the word. Then, you can blend the sounds together to make the whole word.

SESSIONS 4-13

Intervention B (Control Group)

General Directions: For each lesson, read the passage aloud to the group while you point to each word. Then guide the group in reading the passage along with you two times (echo reading, then choral reading). Put the passage aside and take out the word list. Practice the phonological awareness activities the set of words. Finally, read the passage with the students one more time. Be certain to make *no connection between the phonological awareness tasks and the passage.*

Script: **Today we are going to practice reading a passage and then we'll practice some of the skills we have already learned. First, I want you to listen to me read and follow along with your eyes.** (Read passage and point to each word.)

This time, I'd like for you to read the passage along with me. First, look and listen while I read a sentence. Then you read the sentence with me. Everybody ready? (Read the passage again, still pointing to each word. Read each sentence twice, once as a model then once as the students read with you - echo reading.)

That was terrific! Let's read it one more time, this time let's all read together. Ready? (Read the passage a third

time with students reading along throughout the passage - choral reading.)
(Put the passage aside and show students the list of words.) **Look at these words while I read them aloud.** (Read list aloud to students.)

Do you hear the one sound that every one of these words has? (Assist students in identifying the target sound.) **That's right! All of these words have the** (say target sound) **sound in them.**

Now, let's practice saying these words with Robbie. Robbie will say a word and you see if you can figure out what word he says. (Say each of the words sound by sound in a Robbie-the Robot voice as students blend the sounds to say the word.)

Now, you get to say the words sound by sound so that Robbie can understand them. (Guide the group in saying each word sound by sound. Then ask individual students to practice segmenting each word.)

That was good! (Put the word list aside and show students the passage again.) **Now we are going to read our passage one more time.** (Guide students in final choral reading of the passage.)
Good reading!

SESSIONS 14-18

Intervention A (Experimental Group)

General Directions: This phase of the intervention is similar to the last phase. The passage reading portion is exactly the same. The difference is that the next five passages highlight vowels for target sounds. The activities with the sounds are, therefore, somewhat different. For each lesson, you will continue to: read the passage three times (modeling, echo reading, then choral reading), ask the students to help you find words that have the target sound, write each word, practice the phonological awareness activities with each set of words, and read the passage again together. Remember to make *explicit the connection between the phonological awareness tasks and the passage reading*.

Script: **Today we are going to practice reading a passage and then we're going to do some new activities. First, I want you to listen to me read and follow along with your eyes.** (Read passage and point to each word.)

This time, I'd like for you to read the passage along with me. First, look and listen while I read a sentence. Then you read the sentence with me. (Read the passage again, still pointing to each word. Read each sentence twice, once as a model then once as the students read with you - echo reading.)

That was terrific! Let's read it one more time, this time let's all read together. Ready? (Read the passage a third time with students reading along throughout the passage - choral reading.)

Good reading! Now I'd like for you to help me look at the words in this passage. Help me find all the words that have a (say target sound) **in them. I'll write down each word that we find.** (Assist students in finding all words with the target sound and write them down.)

Great! Now, let's try to find as many words as we can that rhyme with the words we found. Words that rhyme have different beginning sounds, but the same middle and ending sounds. I'll show you. This word is __________. (Say a word from the list.) **A word that rhymes with this word is __________.** (Say a word that rhymes with the selected word.) **Listen to this word.** (Point to and say another word from the list.) **Who can think of a word that rhymes with _______?** (Continue down the list and have students generate rhymes for each word that has a rhyme.)

Now let's tell Robbie some of the words. (Call on each child to segment a word.)

Now listen to the words as Robbie says them. Tell me when you know which word he is saying. (Say each word sound by sound - in random order - while students blend the words.)

That was good! Now we are going to read our passage one more time together. This time, when we come to one of the words with the (say target sound) sound, **we'll say it sound by sound and then say the whole word.** (Read the passage with the students, stopping to segment and blend each word with the target sound.)

Good reading! Remember, when you are reading, that you can say a word sound by sound to figure out the word. Then, you can blend the sounds together to make the whole word.

SESSIONS 14-18

Intervention B (Control Group)

General Directions: This phase of the intervention is similar to the last phase. The passage reading portion is exactly the same. The difference is that the next five passages highlight vowels for target sounds. The activities with the sounds are, therefore, somewhat different. For each lesson, you will continue to: read the passage three times (modeling, echo reading, then choral reading), provide a list of words that have the target sound, practice the phonological awareness activities with each set of words, and read the passage again together. Be certain to make *no connection between the phonological awareness tasks and the passage.*

Script: **Today we are going to practice reading a passage and then we're going to do some new activities. First, I want you to listen to me read and follow along with your eyes.** (Read passage and point to each word.)

This time, I'd like for you to read the passage along with me. First, look and listen while I read a sentence. Then you read the sentence with me. Everybody ready? (Read the passage again, still pointing to each word. Read each sentence twice, once as a model then once as the students read with you - echo reading.)

That was terrific! Let's read it one more time, this time let's all read together. Ready? (Read the passage a third time with students reading along throughout the passage - choral reading.)

(Put the passage aside and show students the list of words.) **Look at these words while I read them aloud.** (Read list aloud to students.)

Do you hear the one sound that every one of these words has? (Assist students in identifying the target sound.) **That's right! All of these words have the** (say target sound) **sound in them.**

Now we're going to think of words that rhyme with these words. Words that rhyme have different beginning sounds, but the same middle and ending sounds. I'll show you. This word is __________. (Say a word from the list.) **One word that rhymes with this word is** __________. (Say a word that rhymes with the selected word.)

Listen to this word. (Point to and say another word from the list.) **Who can think of a word that rhymes with** _______**?**

(Continue down the list and have students generate rhymes for each word that has a rhyme.)

Now let's tell Robbie some of the words. (Call on each child to segment a word.)

Now listen to the words as Robbie says them. Tell me when you know which word he is saying. (Say each word sound by sound - in random order - while students blend the words.)

That was good! (Put the word list aside and show students the passage again.) **Now we are going to read our passage one more time.** (Guide students in final choral reading of the passage.) **Good reading!**

APPENDIX G

TARGET SOUNDS AND READING PASSAGES

The boy rode in the big balloon across the blue sky.

The boy looked below the balloon.

He could see for miles.

He saw a beautiful beach.

He saw people in a boat.

The people looked so small.

He saw a bird fly below him.

The boy felt like a bird!

Pam the marshmallow began to melt.
Pam moaned to her mother, "Mom, I'm melting!
What must I do?"
Mom said, "Make a move away from the window.
Mister Sun won't be able to melt you."
Pam moved to the middle of the room.
Mister Sun passed by and the melting was no more.

Pat pedaled to the pond.

She went to play with her puppy.

Pat and her puppy splashed and played in the pond.

They stopped awhile to nap by the pond, then they splashed some more.

Pretty soon, it was time for supper.

Pat pedaled home and her puppy panted along behind her.

It was a perfect day.

Ralph roared at his roommate, Ronnie.

There was no more roast dinosaur in the refrigerator.

Ronnie said, "I'm sorry. I ate all your roast dinosaur."

Ralph said, "I'm sorry to roar. I get so grumpy when I'm hungry."

Ronnie and Ralph ran to the store for more dinosaur.

The roommates roasted another dinosaur for dinner.

Nina and Nona are twins.

Nina likes pennies, but Nona likes nickels.

Nina’s pennies are in a piggy bank.

Nona’s nickels are in a bunny bank.

Nina has ninety-nine pennies.

Nona has ninety nickels.

Who has more money?

Once there was an ugly bug named Wiggle.

Wiggle had a lot of big hairy legs.

Wiggle was very good at games.

He was great at soccer.

Wiggle got a goal every game.

He could get the ball to go past the gate.

When Wiggle got a goal, he got a lot of hugs from other bugs.

Sue had a silly snake named Monty.
Monty made a hiss sound when he was happy.
Sue told him to say less.
This made him mad.
One day, Monty got loose.
Sue began to search.
She said, “I miss Monty!”
Just then, she saw Monty slither to her.
Sue said, “I could kiss you! Yes, you can hiss all you want.”

Dolly was a dog that could dance.
Dolly would dart and dash and dip when she danced.
Dolly was a great dancer.
She would dance almost anywhere.
She could dig a hole and dance in it.
But she said she would never dance on a ladder.
Dolly was not a dumb dog!
She knew that would be dangerous.
She did dance a lot, but she didn’t dance on ladders.

Tom told his friends to wait for him in front of the store.

He went in to buy some cookies.

Tom bought enough cookies for all of his friends.

He took the cookies to give to his friends, but they were gone.

Tom was so mad. He stomped his feet and his face turned red.

Just then, his friends came out of the store, too.

They handed Tom a soda and asked him what was wrong.

He just smiled at them. Now his face was red for another reason.

Four funny fish swam in the pond.

Fred, the first fish, found a frog for dinner.

Floyd, the second fish, said “Fork it over, Fred!”

Fran, the third fish, said, “You're my friend, Fred, fling the frog to me.”

Flo, the fourth fish, said, “Forget that frog folks, he's mine."

All the arguing made Fred the fish furious.

Fred told the fish that he would share the frog if they could be friends again.

Just then, the frog fled and the funny fish had to find another dinner.

Jack had a big red hat.

Jack's friend Sam was sad because he had no hat.

Sam and Jack went to the hat rack to find a hat for Sam.

On the hat rack, Jack and Sam found a little blue hat.

The hat was too small for Sam's head.

Jack asked Sam if he wanted to try on the red hat.

Sam knew Jack's hat was the hat for him.

Sam gave Jack the blue hat.

They were both glad to have a new hat.

Meg and Ted took their sled to the top of the big hill.

They saw a sign that read "Do Not Sled."

Meg let Ted get on the sled.

They yelled, "Ready, set, go!"

Meg and Ted let the sled run until they spotted the cliff.

They yelled, "Help!"

The next thing they knew, Meg and Ted were in their beds with broken legs.

Kim is a big fish who lived in a big dish.

Rick came to live in the big dish with Kim.

Kim told Rick that two fish could not fit in the dish.

Rick told Kim that the dish was big enough for six fish.

Kim was so mad that she did a flip and almost missed the dish.

Rick flipped Kim back in with a fin.

Kim was so glad that she gave Rick a big kiss.

Mom and Bob wanted to pop popcorn.
Mom told Bob, "The top must be on tight."
The top was on so Bob popped and popped.
Bob got hungry for popcorn so he lifted the top.
It was too hot so Bob dropped the top.
Mom said, "Get the mop, Bob!"
When Bob had mopped the last spot, he got his popcorn.

Bud and Gus started a new club.

They built a clubhouse out of junk from the dump.

They had a lot of fun in their club.

They planned to sleep in the clubhouse, so Gus brought a bun and a jug of water.

But, Bud forgot his jug and his bun.

Bud took the bus to the store for a bun and a jug.

Bud jumped off the bus at the clubhouse.

Gus looked up and said, "Now the fun has really begun!"

Target sound /b/

boy
big
balloon
blue
below
beautiful
beach
boat
bird

Target sound /g/

ugly
bug
Wiggle
big
legs
good
great
goal
game
get
go
gate
got
hugs

Target sound /m/

Pam
marshmallow
melt
moaned
mother
Mom
I'm
melting
must
make
move
Mister
moved
middle
room
more

Target sound /s/

Sue
silly
snake
hiss
sound
say
less
this
loose
search
said
miss
just
saw
slither
kiss
yes

Target sound /p/

Pat
pedaled
pond
play
puppy
splashed
played
stopped
nap
pretty
supper
panted
perfect

Target sound /r/

Ralph
roared
roommate
Ronnie
there
more
roast
dinosaur
refrigerator
sorry
roar
grumpy
hungry
ran
store
for
roasted
another
dinner

Target sound /d/

Dolly
dog
could
dance
dart
dash
dip
dancer
dig
said
dumb
would
dangerous
did
didn't
ladder

Target sound /n/

Nina
and
Nona
twins
pennies
nickels
bank
bunny
ninety
ninety-nine
money

Target sound /t/

Tom
told
to
front
store
went
bought
took
stomped
feet
turned
just
out
too
what
at

Target sound /f/

four
funny
fish
first
found
frog
for
fork
friend
fling
fourth
forget
folks
furious
if
friends
fled
Fred
Floyd
Fran
Flo

Target sound /a/

Jack
had
hat
Sam
sad
and
rack
asked
glad

Target sound /e/

Meg
Ted
sled
read
let
get
yelled
set
Help
next
beds
legs

Target sound /o/

Mom
Bob
pop
popcorn
top
on
popped
got
hot
dropped
mop
mopped
spot

Target sound /u/

Bud
Gus
club
clubhouse
junk
dump
fun
bun
jug
but
bus
jumped
up
begun

Target sound /i/

Kim
is
big
fish
lived
dish
Rick
live
fit
in
six
did
flip
missed
flipped
with
fin
kiss

APPENDIX H

PROCEDURAL RELIABILITY OBSERVATION FORM

Procedural Reliability Observation Record

Instructor ______________ Observer ______________

Please record, by placing a check in the appropriate box, each instance in which the instructor makes an explicit reference to the application of phonological awareness skills in context.

30	60	30	60	30	60	30	60	30	60

30	60	30	60	30	60	30	60	30	60

30	60	30	60	30	60	30	60	30	60

30	60	30	60	30	60	30	60	30	60

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BIOGRAPHICAL SKETCH

Holly Barnes Lane was born in Jacksonville, Florida, on August 26, 1962. The youngest of four children, Holly graduated from Episcopal High School in Jacksonville in 1979. Holly received a B.A. in special education with an emphasis in mental retardation from the University of Florida in 1983. She received a M.Ed. in special education with an emphasis in learning disabilities from the University of Florida in 1990.

During the period from 1984 through 1992, Holly taught in special education classes in Duval, Clay, and Alachua Counties in Florida. Her teaching experience included teaching students with mild to severe intellectual, emotional/behavioral, and learning disabilities. Most of her teaching experience was at the elementary level, but she taught students of high school age and adults, as well.

While completing her doctoral studies at the University of Florida, Holly served as a graduate teaching assistant and as a graduate research assistant in the Department of Special Education. She also served as a liaison/consultant and, later, as an educational diagnostician at the Multidisciplinary Diagnostic and Training Program, a joint project with the Departments of Pediatric Neurology and Special Education.

During her doctoral program, Holly was also active in the Special Education Association of Graduate Students, serving as treasurer. She is a member of the American Educational Research Association, several divisions of the Council for Exceptional Children, the Learning Disabilities Association of America, and Phi Lambda Theta Honor Society.

In the future, Holly plans to continue her research in the area of beginning reading acquisition and the prevention of reading disabilities. Her other areas of research interest include family literacy development, metacognitive strategy instruction, classroom management, and adjustment problems of students with learning disabilities. She also plans to teach at the university level.

I certify that I have read this study and that, in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Cecil D. Mercer

Cecil D. Mercer, Chair
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I certify that I have read this study and that, in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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